

DISCOVER DIVING

The Diver's Journal



February 1991
US \$2.95 • Canada \$3.75

Dive Travel

- Sipadan • Bequia
- Costa Rica • Australia

Dive Locations:

- California's Garrapata State Park
- Washington's San Juan Islands
- Hawaii's Ni'ihau
- Missouri's Bonne Terre Mine
- New Jersey's Sea Girt Reefs
- Boston Harbor

HOW TO WRECK DIVE

The Hazards of Travel

Coral Reef Ecology

Macro Photography

Interview: *Marty Snyderman*

Maximizing Your Bottom Time

MEGAMOUTH

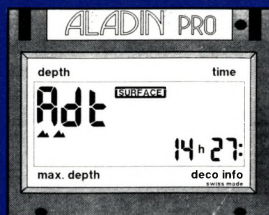
Sea Life:

- Tarpon
- Hawkfish
- Rock Cockle

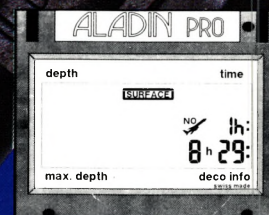


THERE ARE LEADERS AND THERE ARE FOLLOWERS

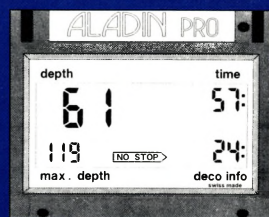
ALADIN PRO by BEUCHAT



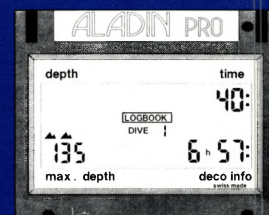
SURFACE MODE, indicating altitude sector and adaptation time when diving at altitudes.



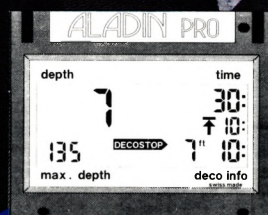
SURFACE MODE, after 10 minutes of surfacing flight restriction and total time of desaturation are displayed.



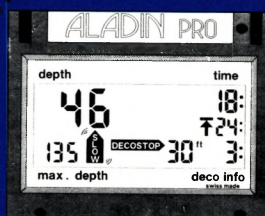
DIVING MODE, below depths of 3 feet the Aladin Pro displays all pertinent information related to NoDECOSTOP current depth, max depth and dive time.



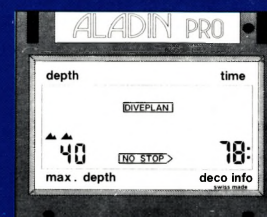
LOGBOOK, the logbook will display a total of 9 dives to include, dive number max depth-dive time-surface interval-and altitude sector when diving at high altitudes. Ascent rate and deco stop alarms are also displayed if activated during dive.



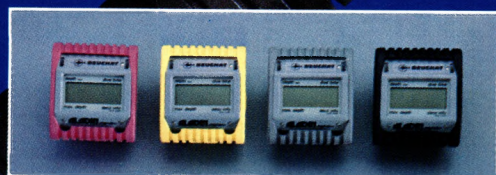
DECOMPRESSION STOP INDICATOR, after the No-Deco time limit has exceeded the DECO STOP arrow appears indicating required decompression. Stop depth, time, and total time of ascent are also displayed.



ASCENT RATE ALARM, when the recommended rate of ascent of 33 feet/min is exceeded a black upward pointing arrow flashing SLOW appears followed by an ACOUSTIC beep warning of a too rapid ascent rate.



DIVE PLAN, for repetitive dive planning the Aladin Pro will display Non-decompression time limits in 10 feet increments from 30 feet to 140 feet and current altitude sector if diving at altitude.



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10:20 am.

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Bob, our accountant, is going
over the latest numbers.
I need to stay focused.
Gotta stop daydreaming.

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- NAUI Japan — An International Resource
- How to Succeed in the Numbers Game — Direct Marketing for the '90s
- Divers at Risk — Causes of Sudden Death Syndrome
- The Training Game — A Crisis in the Making?
- Cave Diving — Risks and Rewards for Diving Educators

Saturday, February 9

- Public Safety Diving — Rescues and Recoveries
- NAUI Australia — An International Resource
- Retailing Instructors — Jim Hicks' NAUI College
- Building the Perfect Employee — Bob Brayman's NAUI Career Center
- What's With all this Oxygen Stuff? — Debunking the Myths
- The Bare Facts of Underwater Video — An Instructor's Guide

Sunday, February 10

- Risk Management — Protecting It in the '90s
- Dive Computer Specialty — An Instructor's Guide
- NAUI Instructor Trainer Update

Registration Information

Call NAUI Order Desk at (800) 553-6284 or (714) 621-5801 and
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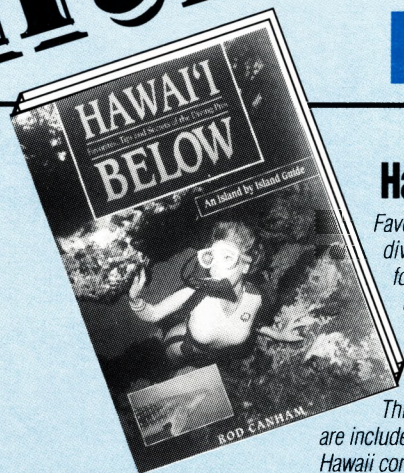
Confirmation and tickets will be sent within two weeks from date of
order. Pre-registration discounts apply to orders received at HQ
by January 15. Late registration packets may be picked up one
hour prior to beginning of program.

All pre-show programs will be held at the Ramada Suites-St.
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Favorites, tips and secrets of the diving professionals. A beautiful four color island by island guide of Hawaii's most popular and unique dive sites. Over 180 dive areas are referenced from a diver's viewpoint. Things to do topside after diving are included to make any vacation in Hawaii complete. by Rod Canham

Dive Computers

A Consumer's Guide to History, Theory and Performance

Ken Loyst with Michael Steridley

Dive Computers

A consumer's guide comparing 24 of the markets dive computers. Designed to provide valuable information for dive computer owners or buyers. Includes history, background theory, and a performance comparison of each dive computer, with an extensive glossary of terms. by Ken Loyst with Michael Steridley

Solo Diving

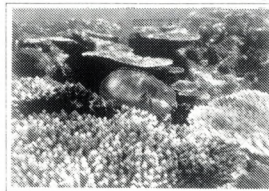
The Art of Underwater Self-Sufficiency

Robert von Maier

Solo Diving

Addresses the issues of solo diving including self-sufficiency in diving, diving fitness, dive management guidelines, emergency breathing systems, and gives the opinions of leaders from almost every facet of the diving industry about diving alone. by Robert von Maier

SEA SHADOWS



BY CARLOS EYLES

Sea Shadows

The only black and white underwater photography book in the world that blends a rare photographic mood with famous historical quotes and verses. by Carlos Eyles

Other Titles From Watersport Books



Last of the Blue Water Hunters

The extraordinary true account of the greatest free divers in the world. Blue Water Hunter is also about the sea, exposing the reader to an ocean world, that is never seen by the majority of divers. By Carlos Eyles

Diving Free

Diving Free offers methods for overcoming the barriers that prevent today's divers, whether beginning or advanced, from realizing their full capabilities in the water. by Carlos Eyles

The Amber Forest

Explore the underwater world of California's enchanted kelp forests through this beautiful four color book. The Amber Forest is devoted to portraying the kelp forest's natural habitats, biology, and ecosystems. by Ron McPeak, Dale Glantz and Carole Shaw

The Egyptian Red Sea Diver's Guide

This 237 page four color guide is a must for anyone traveling to the Red Sea. This guide book includes information about trip planning, land excursions in Egypt, and diving in the Red Sea. by Eric Hanauer



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DISCOVER DIVING

Vol. 9, No. 1

Jan/Feb 1991

C O N T E N T S

GENERAL INTEREST

- Spearfishing:** Art & Ethics 39
by Carlos Eyles
- Future Reefs, Empty Reefs?** 52
by Alexander Stone
- MEGAMOUTH:** Shark from the deep ... 54
by Bruce Elliott Rasner
- The Way It Was:** Mystery Plane 63
by Dr. Samuel Miller
- Interview:** Marty Snyderman 80
by Michael Menduno & Mark Conlin
- Fear Among Fishes** 90
by Melissa Piquett Andersson
- Looking Back:** 114
Another Near Miss - by Dick Anderson

DIVE LOCATIONS

- Hawaii:** Ni'ihau 16
by Rod Canham
- Pacific Northwest:** 20
San Juan Islands - by Ed Weber
- Midwest:** Missouri's 32
Bonne Terre Mine - by Joe Belanger
- Log Entry:** Bay Islands, Honduras 42
by Ken Loyst
- Northeast:** Boston Harbor 50
by Lorraine Marzilli
- Costa Rica & Cocos Island** 58
by Walt Stearns
- Northeast:** New Jersey's 66
Sea Girt Artificial Reef - by Herb Segars
- Australia's Great Barrier Reef** 84
by Ed Weber
- California:** Garrapata State Park 92
by Gill Cruz

SPECIAL FEATURES

TO BE IN BEQUIA

by Hobie & Karen Hawthorne 72

Sipadan

Above & Below by Eric Hanauer 44



ON THE COVER

Photo by W. Gregory Brown • This issue's cover features an Arc-eye hawkfish in the Fiji Islands. The photo was taken using a Tussey-housed Nikon F3 with a 105 micro Nikkor lens, and a single Ikelite 225 strobe. The film used was Kodachrome 64, an aperture set on f22, with a 1/80 exposure.

DIVING TRENDS

Technical Section

- Extend Your Bottom Time** 11
by Steve Barsky
- Medical Facts:** Malaria 14
The Hazards of Travel
by Dr. Tabby Stone
- Underwater Photography** 24
Lighting Techniques for Macro Photography
by Marty Snyderman
- Compressed Comments: O-Rings** .. 30
by Michael Dunning
- Ocean Facts:** The Rock Cackle 31
by Robert von Maier
- Shipwreck Diving** 36
by Daniel Berg and Steve Bielenda
- Atlantic Tarpon** 70
by Marty Snyderman
- Things** 78
About Abridged Dive Tables
by Eric Hanauer
- Coral Reefs:** Zones of The Reef 96
by Douglas Fenner
- Hawkfish** 100
by W. Gregory Brown

DIVE INFO

- Advertiser Index** 110
- Classifieds** 110
- Dive Store Directory** 111 - 113
- Marketplace** 106 - 109
- News Briefs** 102 - 105

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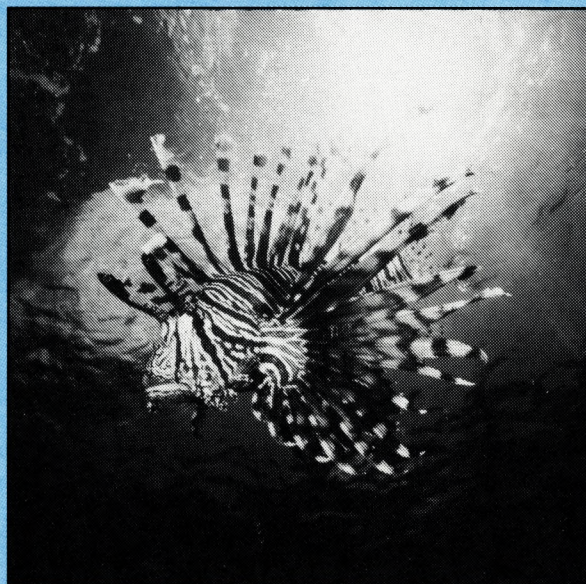


Photo by Steve Rosenberg

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FROM THE PUBLISHER

Happy New Year!

It is at this time each year that the staff of **Discover Diving** looks at the accomplishments of the last year and plans for the coming issues. We would like to thank you, our readers, for making 1990 the most successful and exciting year we've had so far. We envision 1991 as even better as we expand our horizons and include even more adventures in **Discover Diving's** pages.

Discover Diving magazine has served the interests of West Coast divers for eight years and in 1990 we began to expand East. We have brought you information about local dive sites, reviewed new products, published extensive equipment comparisons, featured exotic travel destinations, and kept our readers informed on diving topics from photography to the environment, medical facts to sea creatures, and diving history to spearfishing. In turn, our readership base has increased dramatically each year, now reaching tens of thousands of active divers, diving students, and diving dreamers.

To support our commitment to feature dive destinations in our own backyards (and within everyone's budget), we have included articles on diving the Pacific Northwest, California, Mexico, Hawaii, Texas, the Northeast and Florida. To introduce you to other dive locations around the world and to help you plan for future vacations, we've highlighted exotic travel locales such as the Solomon Islands, Fiji, and Kenya. We changed our overall look, added more color, and increased our page count to accommodate more articles on diving.

1991 begins the ninth year of **Discover Diving** magazine. With the advent of the new year comes our promise to continue to bring you information on quality dive locales within the United States, and the best of diving worldwide. But **Discover Diving** is much more than a travel magazine. We will also continue to bring you product information, medical news, interviews with the Neptunes of diving, environmental issues, photography techniques, sea creature information, diving fiction, controversial diving topics, and ways to help you become more proficient in diving.

We are premiering some new columns this year with the anticipation of positive feedback from you - our readers. First is **The Way It Was**, brought to you this issue by Dr. Samuel Miller. This column will be dedicated to diving from out of the past. Another addition soon to gain recognition in the pages of **Discover Diving** will be **Diving Ex-pats**, a series of articles on diving ex-patriots, people who move half way around the world to follow their dreams. Also new for 1991 will be **High Tech**, a column which will present ongoing information on "high tech" diving. Local dive destinations have been expanded to include the Northeast, the Midwest, Texas, and Florida in upcoming issues.

An incredible excitement has gripped the staff of **Discover Diving** as we look forward to our new year of expansion. The prospect of being the best dive publication in the industry is becoming a reality. As the new year sets in, our resolution is to sustain the quality of material presented to our readers, find new avenues of interests, and provide images from our special world for everyone to enjoy.

We wish you a prosperous New Year with many fun diving experiences and hope that **Discover Diving** brings you the information and adventures you seek.

Ken Loyst
Publisher

1950's



1960's



1970's



1980's



1990's

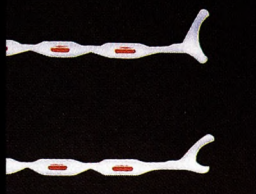
WELL WORTH THE WAIT...

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How to Maximize Your Bottom Time

(Without Really Trying)

Here are 6 tips to increase your bottom time by 20%-40% no matter where you dive!

by Steven Barsky

Many years ago, when I was much younger, I took a job as a diving guide and instructor in a Caribbean resort. As my plane approached the island air strip, I gazed down at the clear waters of the reef and thought this was how heaven would look! Not only would I be paid to dive in tropical waters, but I would also meet beautiful women divers who would be impressed with my diving abilities. Well, I was right about the first part...

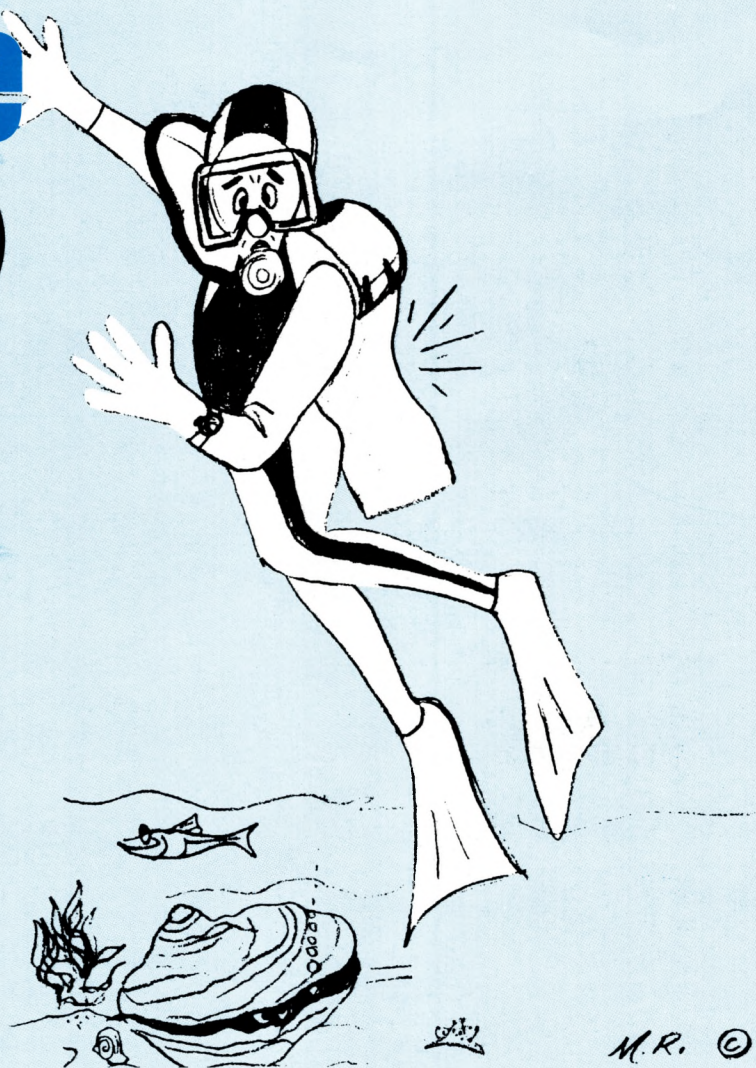
My first few days on the job were to be devoted to learning the local reefs and the diving techniques used by the guides. Since all my diving experience was in California, and I had never been diving in the tropics, I had a lot to learn.

On my first dive I flipped backwards over the side of the boat and experienced my first taste of the warm waters of the Bahamas. The water temperature was in

the low 80's and felt like a bath tub. I followed the other guide down to the bottom and watched his technique. Basically, he stationed himself at the anchor line and watched the tourist divers as they explored the reef. Equipped with an octopus rig, the guide positioned himself where he could go to the aid of any diver who might need him.

Since the visibility was close to 100 feet, it was easy to keep everyone in sight.

As the divers began to run low on air they would signal the guide and swim up the anchor line to return to the boat. After three of the divers ran low on air and signalled they were ascending I checked my gauge and saw it was time for me to go



up too. I signalled my fellow guide and returned to the surface. About ten minutes later the rest of the group returned and we motored back to the dock. When we reached the pier, after the guests had departed, the guide took me aside for a little chat.

"You've never worked as a dive guide before, have you?", asked my tutor.

"No, I never said I did," I admitted.

"Well, you've got to learn to maximize your bottom time. As a dive guide, you can't afford to run out of air before your guests. You've got to be the last diver on the bottom to be sure that everyone returns to the boat safely. If your air doesn't last longer than everyone else's you won't be in a position to help a diver who runs out of air underwater," explained the guide.

From that savvy instructor I learned several tricks which will help you to maximize your bottom time, no matter where you dive. Each technique will help you to extend your dive time just a bit, but all of them taken together can increase your bottom time by as much as 20-40%! If your dives don't last as long as you would like, read on for the hints used by experienced divers.

Tip #1

Descend with the least amount of effort...

Many divers waste a large volume of air during their initial descent. Part of this is due to their efforts to equalize, but much of it is due to problems with buoyancy control. While many divers weight themselves too heavily, another group either is too light or does not know how to control their descent.

Divers who are too light must struggle to get to the bottom and use up a great deal of air doing so. It is not uncommon for a diver who is weighted improperly to use up as much as 500 p.s.i. during a descent. This represents a significant quantity of air.

Divers who have not learned to control their buoyancy may be weighted correctly, but don't always control their breathing properly during descent. They may use as much air as a diver who is underweighted. If all the air is out of your buoyancy compensator and/or dry suit, you should be able to start your descent by exhaling. However,

it is important to keep your lung volume low until suit compression takes over and you sink more easily. If you inhale large volumes of air during your descent, you will find descending difficult. The trick is to keep your lung volume low. Breathe shallowly during the first part of your descent until you begin to sink more easily.

Tip #2

Weight yourself properly...

You probably have heard many instructors stress the importance of proper weighting, but did you realize that over-weighting affects your air consumption? When you are heavily weighted you must add large amounts of air to your buoyancy compensator if you are diving with a wetsuit, or dry suit, if you are diving in colder waters.

Large B.C. or dry suit air volumes in themselves don't use much air, but repeated depth changes during your dive will cause you to constantly adjust your buoyancy during the course of the dive. To reduce dry suit volumes be sure you pick a suit which fits you properly and has the snugest fit possible. Use a custom dry suit if a stock suit doesn't fit you with a minimum volume. Just be sure the suit has enough length to allow you to bend, squat, and kick easily.

Large air volumes in your B.C. or dry suit are also more difficult to control as your depth becomes shallower. This becomes especially critical during ascents. Weight yourself properly and use the minimum volume of air in your suit or B.C. to achieve neutral buoyancy.

Tip #3

Streamline your equipment...

The more streamlined your equipment, the easier your diving will be. When you can swim with less effort your air consumption goes down. Reduce your drag through the water by trimming excess straps, or taping them back. Use a low profile buoyancy compensator. If you wear a dry suit, use a custom model which fits your body and doesn't have large folds of excess material flopping about.

Tip #4

Learn to control your breathing...

Experienced divers are constantly aware of their breathing rate. By concentrating on breathing slowly and deeply you can make a dramatic difference in your air consumption.

While you should never hold your breath, the key to breath control is to make your inhalations and exhalations as long and slow as possible while you are on the bottom. Initially, you will need to practice this skill, but in just a few dives it becomes a very natural habit. Whenever you are ascending, however, your breathing should be normal, with an emphasis on exhalation.

Where most divers use large amounts of air is during the exciting parts of a dive. For example, while wrestling a 10 pound lobster out of a cave, or photographing a white shark, most people use more air than normal. The experienced diver learns to recognize when his air consumption is increasing and concentrates on regaining control of the breathing cycle.

Some of the newer dive computers include an air consumption monitoring display which will tell you how much bottom time you have left according to your breathing rate. Using these devices is an excellent way to train yourself to use less air.

Tip #5

Use a dive computer...

If you're not using a dive computer already, get one! Today's dive computers are small, light, and extremely reliable.

Most dive computers give you the maximum amount of bottom time possible, yet are more conservative than conventional dive tables. As smart divers know, the secret is in their multi-level diving function. Used properly, a computer will offer you longer bottom times with safer profiles.

As an example of the safety of the tables, I recently participated in a study conducted by Karl Huggins, developer of the algorithm that is used in the Edge, Skinnydipper and Delphi. During a week long dive trip, Karl took Doppler readings on me daily while I was diving with the Delphi. The Doppler is an electronic device

which detects the bubbles which cause decompression sickness in the blood stream. Not once during a week of intense, repetitive multi-level diving did Karl detect any bubbles in my system. Any doubts which I had about diving computers were completely dispelled by the end of the trip. (Look for the new book on dive computers – **Dive Computers: A Consumer's Guide to the History, Theory and Performance** from Watersport Publishing, San Diego, CA).

Tip #6

Wear the appropriate thermal protection for the water temperature...

Of all the things you can do to increase your bottom time, wearing the appropriate thermal protection is the most important. If you run out of air because you are cold, it doesn't matter how much bottom time your computer says you have left, you must return to the surface.

Appropriate thermal protection is as important in the tropics as it is in colder waters. If your core temperature is 98.6 degrees and the ocean temperature is 80 degrees you will lose heat to the ocean.

Smaller divers are particularly sensitive to water temperature changes. Their body mass to surface area ratio works against them.

Many divers today wear nothing more than a Lycra suit for diving in the tropics. Although these suits are very comfortable and fashionable they don't offer the thermal protection which you would get from an 1/8th inch or 3/16 inch wetsuit. Since most divers don't subjectively feel cold in waters which are 80 degrees or warmer, they fail to realize the water temperature is still affecting their bottom times. This is particularly true if you are an underwater photographer. If you do a good bit of tropical diving, consider investing in a thin wetsuit. The difference you achieve in your bottom times will amaze you.

In waters colder than 65 degrees a dry suit will make an enormous difference in your diving. Most divers find their bottom times increase by 5 to 20 minutes per dive when they switch from a wetsuit to a dry

suit! Although you may not subjectively feel cold in water temperatures colder than 65 degrees you pay a big penalty in air consumption. If you truly want to extend your bottom time, a dry suit is the suit of choice.

Dry suits offer more effective thermal protection for several reasons. First, your body is isolated from the water by a cushion of insulating air. Secondly, since you aren't wet and stay much warmer, your urine production is decreased. When you wear a wetsuit, each time you urinate in the suit you lose a significant amount of body heat. With a dry suit, as long as you don't drink lots of coffee before the dive, you rarely feel the need to urinate while diving. Finally, you don't suffer the same effects of evaporative cooling between dives when you wear a dry suit as compared to a wetsuit.

Where the dry suit becomes most noticeable, and your air consumption is most affected, is on the second and subsequent dives of any given day. After your first dive, the layer of water trapped in your wetsuit is lost and you must warm up a new volume of water on each successive dive. This causes a substantial thermal drain on your body. You use more air as your system burns more oxygen in an attempt to keep warm.

Proper dry suit underwear is crucial for obtaining maximum performance from your dry suit. Using a dry suit with a warm-up suit or sweat suit defeats the efficiency

of the dry suit. The most efficient dry suit underwear is Thinsulate, this is used by the U.S. Navy as well as most other knowledgeable dry suit divers.

Part of your insulation plan for cold water should include appropriate protection for your head, your hands, and your feet. A good hood, gloves or mittens, and boots are essential for cold water diving. If you use a dry suit, it should come equipped with attached boots. The boots should be equipped with ankle straps to help keep them from over-inflating if you invert.

If you dive with a wetsuit, the suit should be replaced at a maximum of every three hundred dives. This is considered the most efficient working life of a suit. Although the suit may outwardly appear to be in good shape, some of the cells of the material of the suit break down each dive. After three hundred dives most wetsuits have decreased noticeably in their thickness and efficiency.

Maximizing Your Bottom Time Makes Diving More Fun

If you can increase your bottom time you'll get more diving for your money. But, it's important to increase your bottom time safely. By using the techniques we've discussed you'll find your diving is more relaxed and enjoyable. You just might also have time to take more pictures or grab another lobster...



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THE HAZARDS OF TRAVEL...

By Tabby Stone, M.D.

MALARIA

We are in the jet age. Within 48 hours of leaving home in the United States, we can arrive at almost any dive location in the world. At many of the tropical locations, along with exposure to the beautiful underwater sights comes exposure to diseases not commonly seen at home.

For example, toward the end of a two week tropical vacation in the Solomon Islands a diver suddenly develops shaking chills, fever to 104 degrees or more, headache and general muscle aches. These symptoms last for about six hours, and may recur every 48-72 hours. That diver probably has malaria.

The name Malaria comes from the Italian roots *mal-aria* meaning bad air. It's not a disease related to the air, but to parasites transmitted by certain types of mosquitoes. Malaria is endemic (found at all times) in most tropical and subtropical areas and is one of the most common infectious diseases in the world. In the U.S. it is seen primarily in immigrants or people returning from endemic areas. Several hundred travelers per year return to the U.S. with malaria as an unwanted souvenir of their vacation.

The highest number of malaria cases in tourists follow visits to Africa. Malaria is a risk at many dive destinations in Central America and the South Pacific. The risk in

Papua New Guinea, the Solomon Islands, and Vanuatu is probably as high as that in Africa, but fewer tourists go to these areas so the number of cases is lower than the number in Africa.

Humans can be infected with any of four species of parasites which are members of the Plasmodium family. The four types are called falciparum, ovale, vivax and malariae. Not all types are found in each area where malaria is present and the falciparum species tends to cause the most serious infections.

The malaria parasites have a complicated life cycle with a stage that lives and multiplies in the *Anopheles* species of mosquito, a stage which lives and multiplies in the liver of man, and a stage which is found in the blood of man.

When an infected female mosquito bites a human, malaria parasites may be injected. They travel to the liver, multiply and change to a form which can infect the red blood cells. Malaria parasites which enter the red cells then develop into one of two forms: the form that can infect more red cells, or one which develops into male and female enter other red blood cells and 48-72 hours later, these cells rupture and the symptoms recur. Early in the course of the disease, the illness may seem like "the flu." In severe cases damage to the liver and kidney can occur or there can be infection

of the brain. Deaths from malaria generally occur only with severe infections from the falciparum species.

Malaria is diagnosed by examining stained smears of blood under a microscope. Each species of malaria has it's own typical appearance when present in the red cell. Untreated malaria may continue for about a year. Some types of malaria can cause chronic infection with recurrence occurring as long as 30 years after the initial infection.

DRUGS TO PREVENT MALARIA

Malaria is usually preventable. Medications are available which markedly cut down the risk of infection.

The suggested drugs for malaria prevention change from time to time as parasites become resistant to some of the medications. Over the past ten years the recommendations have changes several times.

Chloroquine (brand name Aralen) has been the major drug for malaria prevention and treatment for years. For prophylaxis (prevention) it's normally taken once a week beginning one to two weeks before entering a malaria area and for four to six weeks afterward.

In areas where strains of falciparum malaria have become somewhat resistant to Chloroquine, other drugs have been used either in place of, or along with Chloroquine.

In the past year, a drug called Mefloquine (brand name Lariam) has become available in the United States. It is currently the drug of choice for malaria prevention in areas where resistant strains of falciparum malaria are found. It is taken weekly beginning one week before going to the malaria area, while there, and for four weeks after returning.

The current second choice drug for areas where Chloroquine resistant malaria is present is Doxycycline (brand name Vibramycin). This is given as a single tablet daily beginning one day before entering the endemic area and continuing until 4 weeks after returning home.

Before the mid 1980's Pyramethamine-Sulfadoxine (brand name Fansidar) was used weekly along with the Chloroquine. Routine use was stopped when it was found that more deaths occurred from medication complications than from malaria. When given weekly, there was one fatal reaction (related to a severe allergic skin condition) in about every 25,000 people taking the medication. This kind of reaction did not occur following single large doses of Fansidar used to treat symptoms of malaria. If you traveled in the past few years you were probably given Chloroquine to take weekly and three Fansidar tablets to carry with you and take only if symptoms of malaria developed and you could not get immediate medical attention. The combination of Chloroquine and Fansidar is now the third choice for those who are unable to take Mefloquine or Doxycycline.

Sometimes Primaquine will be prescribed for daily use during the last two weeks of prophylaxis. It is used to eliminate any parasites in the liver where the other drugs are not effective. However, it can cause breakdown of red blood cells and anemia in people with a common condition called G6PD (Glucose 6-Phosphate Dehydrogenase) deficiency. Testing for G6PD should be done before it is used. Many doctors do not prescribe this drug to patients at low risk for the forms of malaria likely to be in the liver.

The drugs suggested above are those currently recommended by the CDC (Center for Disease Control). As you travel, you may come across other drugs or combinations suggested by local public health au-

thorities. One of these is Proguanil (brand name Paludrine), which is given daily along with Chloroquine in many parts of the world.

PREVENTING MOSQUITO BITES

Drugs cut down the risk of getting malaria but don't completely eliminate it. Therefore, it is important to try to avoid mosquito bites. *Anopheles* mosquitoes feed between dusk and dawn, so that is the time to be especially careful to decrease contact with mosquitoes. Wear clothing which covers as much of the body as possible during the hours mosquitoes feed. Use repellents on exposed parts of the body. The best repellents contain DEET (N, N-diethylmetatoluamide). Ignite insect repellent coils and use flying insect sprays in your room at night. In addition to screens on doors and windows, some resorts provide mosquito netting which should be used while in bed.

BEFORE YOU GO ON YOUR TRIP

Your travel agent may inform you of malaria risks but it is recommended you double check with a medical authority. Contact your doctor, the local health department or a traveler's medical clinic if one is located nearby. The Center for

Disease Control (CDC) in Atlanta has recorded information which can be accessed with a touch tone telephone at (404) 332-4555. Get the information well before the trip. In order to have good blood levels on arrival in a malaria area and to check for reactions, most of the drugs are begun one to two weeks before the trip. Most anti-malarial medications are available in this country but not every pharmacy stocks them. It may take a little while for your local pharmacy to obtain what you need.

AFTER RETURNING HOME

Don't stop your medication until the prescribed four to six week period is finished. Anti-malarial drugs kill the parasites only at certain stages of their life cycle. The treatment after returning home is designed to eliminate any parasites present before they can cause illness. There have been many cases of malaria in people who decided that once they were home the medication wasn't needed any more.

If you become ill within a couple of months after returning home, remind your doctor that you were recently in a malaria area. "Flu" symptoms could be signs of malaria and special blood tests are often needed for diagnosis so proper treatment may be given.

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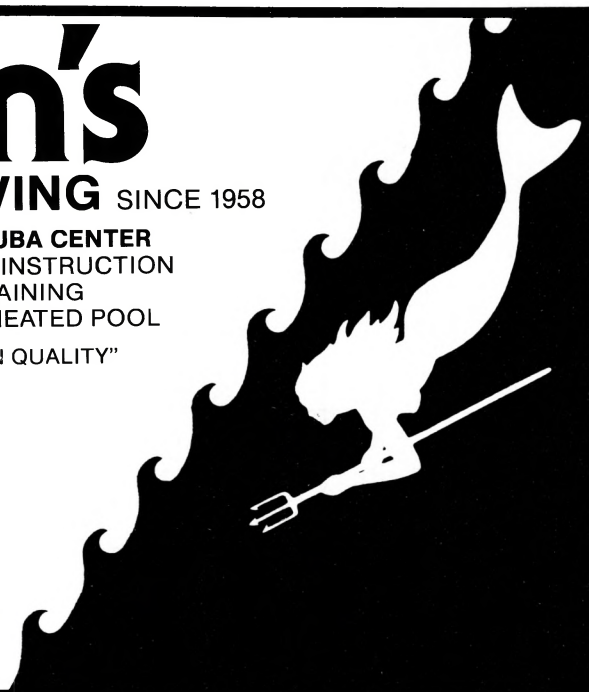
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Hawai'i's Best Kept Secret...

In an archipelago of islands that have been developed into one of the leading tourist destinations in the world, and where that industry is the single leading source of income in the state of Hawai'i, the "Forbidden Isle" of Ni'ihau stands as an enigma. Privately owned by the Robinson family, the 20 mile long by five mile wide island is inhabited by native Hawaiians, who have tenaciously held onto the language of their ancestry, and resisted the influences of the world around them. The island is off-limits to outsiders, and restricted to guests by invitation only. All of the residents are employees of the Robinson family, working in either the sole industry of the island - raising cattle and sheep, or in one of the family's related businesses.



The bicolor anthias fish is one of three related species found at **Vertical Awareness**.

Ni'ihau is separated from Kaua'i by the Kaulakahi Channel, 17 miles off the southwest coast, and 24 miles from the nearest large boat harbor at Port Allen. Depending upon the type of boat, and the channel conditions, travel time ranges from two to three and a half hours. However, that is only when the winds are flat and the seas are calm - in other words, during the summer months only.

It is during this small, precious window of time when the least dived sites in the islands are open. Huge, ancient formations are festooned with rare, colorful tropicals. Hawaiian monk seals, near extinction, and usually found only in the remote northwest, bask lazily on barren ledges. The pelagics we so excitedly dream about at other sites, have yet to taste the intrusion of man, and frequent this area like no other.

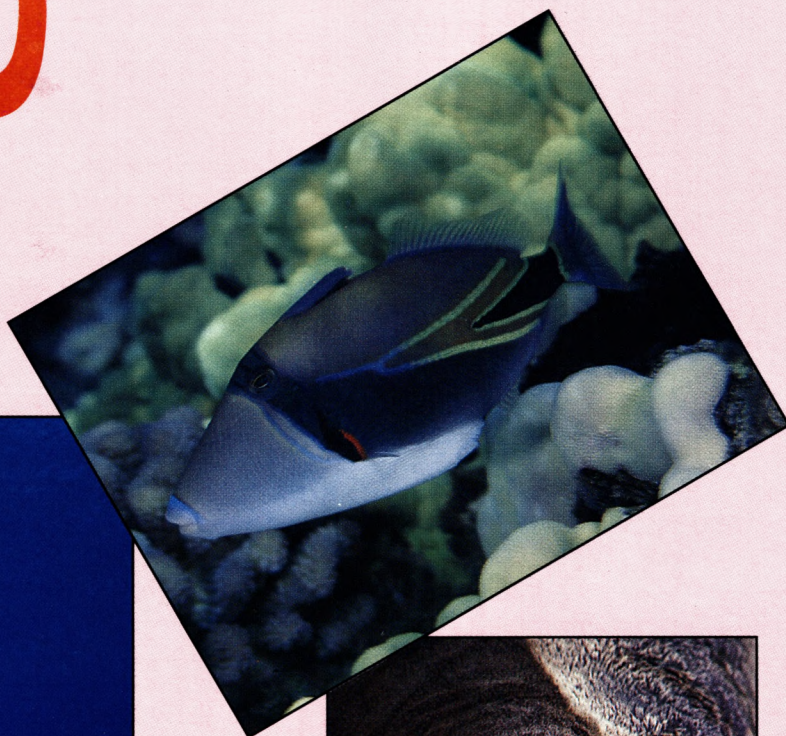
Ni'ihau

The southeast tip of the island is known as **South Point**, with a sloping bottom that ranges from 30 to 90 feet, and blanketed with large boulders. The shoreline wall is interrupted by six foot fissures, with lots of surge fish and sleeping sharks. Corals become secondary to the big critters that are found at this site. Large jacks hang in mid-water or cruise the area, and it offers an ideal photographic opportunity for good shark action. When the current is running, the big boys are in; when it's still, the corals and the shallows are worth the effort to get here. This is wild, east side, virgin diving, and you never know what to expect.

Continuing north along the east side is a ledge line in 50 to 90 feet. **Pueo Point, Stony River,** and **Nenu Point** are similar in their marine offerings with bandit angels, jacks and lobster. It is quite common to see green sea turtles, and whitetip reef sharks as well. **Ni'ihau Arch** is a series

NI'HAU

*Text and photography
by Rod Canham*



Top: The Picasso's triggerfish is more affectionately known as the humuhumu nukunuku a pua 'a.

Left: Rock boring urchins (*Enchinometra mathaei*) etch an alienesque sea scape into the face of a lava plateau at **Vertical Awareness**.

Above: Endangered monk seals, like this one photographed at Sea Life Park on O'ahu, are often sighted basking along the shores of Lehua Rock.

Opposite page: A harmless ash-colored conger eel (*Conger cinereus*) accepts a handout.

OVERVIEW - Ni'ihau

Nickname: The "Forbidden Isle"
 Area: 73 square miles
 Coastline: 45 miles
 Highest peak: Paniau - 1,281 feet
 Population: 202 (1987 estimates)
 County seat: Lihu'e, Kaua'i
 Distance to Honolulu: 152 miles
 Agriculture: sheep, cattle

of ridges and valleys, off the northwestern-most point of the island, with large overhangs and a beautiful archway in 35 feet. Again, large is the emphasis with jacks and sharks frequently sighted. The site can drop off deeply as the arch spans the slot between Ni'ihau and Lehua Rock.

Lehua Rock

Literally a stone's throw across the water is the island of **Lehua Rock**. Owned by the State of Hawai'i, it is a much wilder version of the smaller, but more well known, Molokini Crater. Diving here is compared to what Molokini used to offer 20 years ago, before it was "discovered." The large critters include whitetips, blacktips, hammerheads and manta rays. A small depression on the

south face of the rock is known as Monk Seal Cove for the numerous sightings of these endangered mammals . . .

During a drift dive along the west wall of Lehua Rock, Linda Bail, of Bubbles Below, was leading a dive group that was having an encounter with an octopus. When it left the puka, it let out a customary squirt of ink, temporarily obscuring their visibility. Linda swam out of the cloud, to find her charges had increased by one - a juvenile monk seal had joined the group and was watching the activities intently. The silver colored seal swam to the bottom of a deep ravine, rolled over and scratched his back on the bottom. He laid there, looking up at a group of gawking divers staring back. Before leaving the area, he stopped to check out each of the divers individually, then departed. The encounter left the group appreciative, yet concerned over the seals' potential recovery from their decimated ranks. Existing in numbers believed to be less than 1000 total, they are on the endangered list for the following reasons: sharks which eat them, pollution which poisons them, and their own brutal mating methods that often leaves the female dead.

Vertical Awareness is a stadium-sized sea mount 75 yards off the southwest corner of Lehua Rock. At 40 feet, its top is a broad, flat expanse with a network of grooves cut 12

inches deep by rock-boring sea urchins. Over the sides, it is a straight drop to 280 feet with black coral trees in the 100 to 120 foot range. A crevice in the wall with a "W" shaped crack opens the mount to a view of large *ulua* (jack fish) schooling in 65 feet. When divers "trespass" into their territory, they swim off; when the divers leave, they return. Three species of anthius fish live in the crevices as well as other rare tropicals, and lobster.

Anchoring the boat just off the southwest corner of Lehua Rock, there are two sites along the wall. The one to the right, **Pyramid Point**, is a vertical which drops from 35 to 165 feet. The site is named for the large schools of pyramid butterflyfish that congregate here. *Humuhumu nukunuku a pua'a* (painted triggerfish) cruise the upper part of the ledge, and when threatened, they seek cover in the grooves cut deep by the urchins. The dive can be run as a drift, poking around all of the nooks and crannies in the wall, and looking for rare tropicals. Attention must be given to the clear blue water, to see what is following the same flowing path. Two large manta rays have been sighted here as well as whitetips and grays. At the end of the dive, outgas time can be spent atop a relatively shallow ledge in a protected cove where the octopus command center stage, and the boat awaits for pickup.

Neon Caves is a large cavern to the left of Pyramid Point. It is 60 to 80 feet wide, cutting into the rock over 100 feet, with lava tubes dispersing from there. Encrusting growth compete for space along the walls of the cave, and lights are recommended to bring out the vivid colors. The cave eventually rises to an above-water chamber, and although the inside is devoid of fish, the outside can provide plenty of excitement. A wide variety of tropicals flit about the walls

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and ledges, sharks patrol the same area, and monk seals are not unheard of here. As a point of interest, it is not uncommon to see the mammals sunning themselves along the shoreline at any of these sites.

A large split extending through the crater opens almost to the top. From a distance it looks like a **Keyhole**, but it is within the split that the drift dive to Lehua Gardens begins. Shafts of light, filtering through the crack, penetrate the waters beneath to the depths. At the base of the crack, the bottom begins at 40 feet and slopes to 130 feet. Following the wall seaward, and then turning right, climb on the tidal current and the drift begins. The site, from now on, is so similar to Blue Corner, in Palau, it is startling. A look towards the surface reveals a thick school of silver blue baitfish clinging close to the lava's surface. Farther down the wall, a large school of *ulua* congregate in shallower waters. A glance into the depths revealed several grays and whitetips pacing the wall until we left. The bottom layout around the point is expansive. The

drift seems interminable in length, but non-stop action and beauty are with you the entire way. The dive terminates at Lehua Gardens when the current flows seaward. When it is running towards Ni'ihau, the termination point is the aforementioned Pyramid Point.

Inside the west side of the crater is a substrata of teardrop topography blanketed with fields of octocoral, called **Lehua Gardens**. The dive can be done shallow (25 feet), with a wide variety of rare tropicals, octopus, and *humuhumu's* to enjoy. But the most enjoyable aspect of the shallows are three sinkholes - vertical tubes, six to eight feet in diameter, that dead end, straight down, at 65 feet. The striated walls add to the alienesque atmosphere created by these perfectly circular chimneys. In deeper waters, to 110 feet, pelagic fish are common, as well as grays and whitetips.

Stairway to Heaven is located at the opposite end of the crater. Formidable topographical formations dominate this site in depths of 50 to 130 feet. Large lava ridges are

much more barren than the other side, but offer cruising grounds for eagle rays and sharks. Humpback whales and Pacific bottle-nose dolphins have been sighted in the crater, rounding out Lehua Rock's showcase of Kaua'i's diving at its ultimate, and Hawai'i's diving as it used to be.

Next Issue: Divers and non-divers alike can take a glimpse into Hawai'i below.



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Boat Diving Washington's San Juan Islands

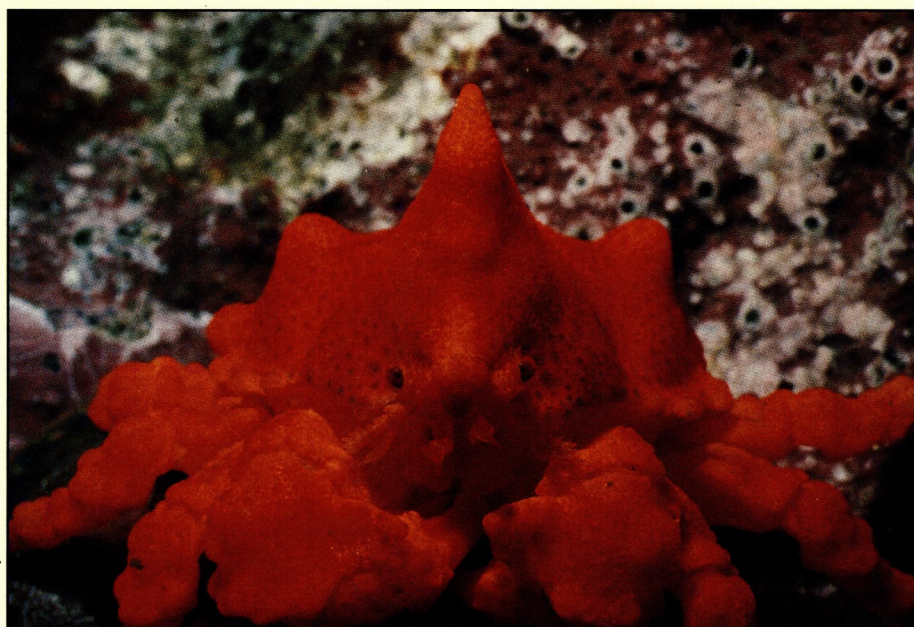


Photo by Renée DeMartin

Beyond the broad northern shoulder of Orcas Island lay three exposed satellite islands which form the northern periphery of the San Juan Archipelago. In the center of this group is a distinctive horseshoe-shaped island named Sucia by the Spanish who explored this area in the 1700's. Sucia Island is actually more a group of islets rather than one mass itself. Long rocky fingers of land break apart to form the eleven small islets of the Sucias.

Within the confines of these small islands are several protected shallow water bays and lagoons. These sheltered anchorages invite weekend boaters and water enthusiasts to come and enjoy Sucia's 562 acres of



Photo by Renée DeMartin

PART TWO

by Edward Weber

Photo by Renée DeMartin

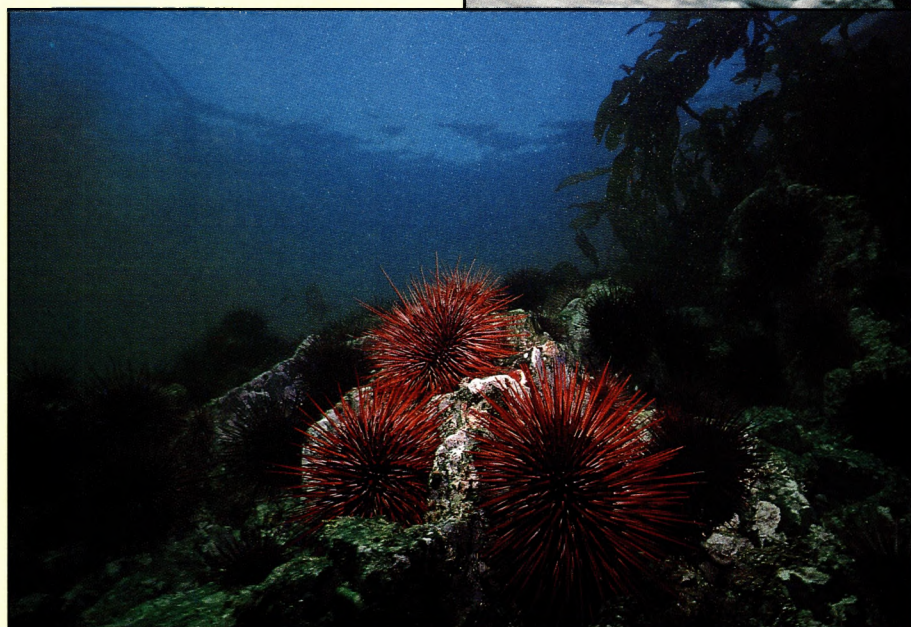
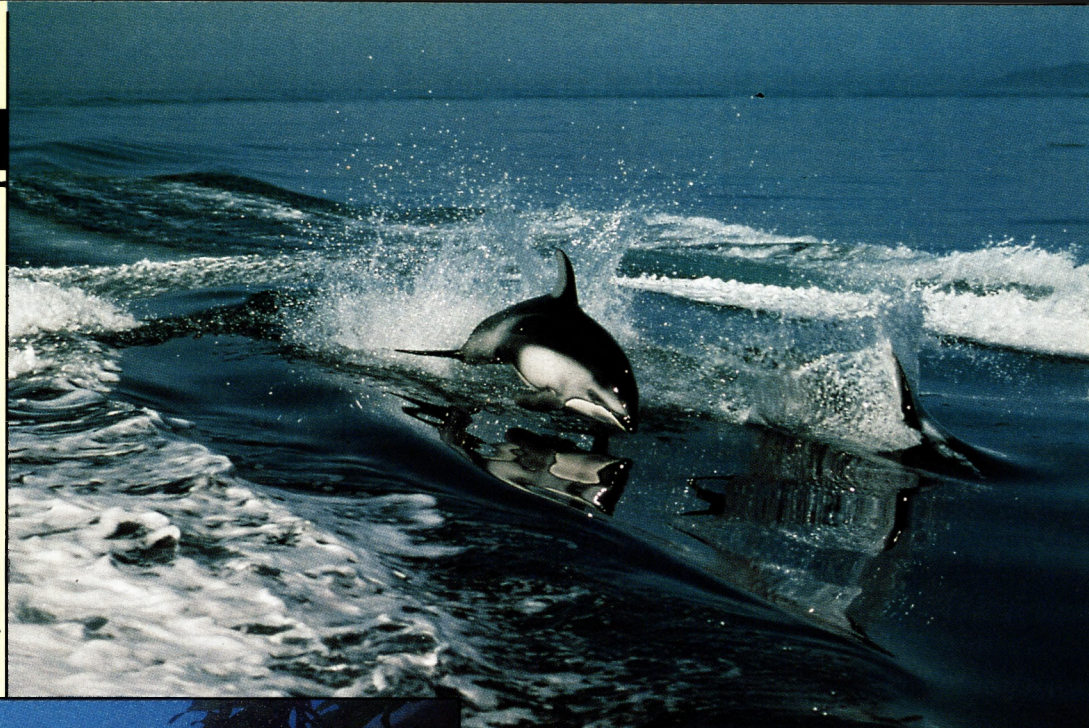


Photo by Ed Weber

Above: Pacific whiteside dolphin plays tag with the boat.

Left: San Juan seascape.

Below: Blood star close-up.

Opposite page top: Fiery red juvenile Puget Sound king crab.

Opposite page bottom: Red Irish lord.

remote island park. In the early 50's several Seattle area yacht clubs banded together to purchase Sucia Island and save it from commercial development. The yacht clubs then donated the island to Washington State Parks who now maintain the island park. Facilities here include campsites, stoves, pit toilets and mooring buoys.

The name Sucia means "foul water" in Spanish; given by the fact that the island is surrounded by innumerable reefs and submerged rocks which proved treacherous for the early day explorers. It is the colorful backdrops and clear water of these same reefs that lure divers to explore Sucia's underwater splendor.

Lying just off Sucia's northern shore and guarding her from the fierce southerlies blowing off the Straits of Georgia is the rocky backbone of **Clements Reef**. Protected as a National Wildlife Refuge, the series of rocks that make up the reef form an interesting structure. Essentially, two rock reefs with one breaking the surface run parallel to one another to form a canyon-like basin running through the center. The exposed rocks on the outside of the reef drop to dramatic vertical walls with depths reaching over 85 fathoms.

Photo by Ed Weber



The walls and passageways that make up this reef are teeming with marine life. Seastars of every size, shape and color, scallops, hydrocorals, sponges and more decorate this underwater stage. The kelp beds along the inside of the reef provide hiding places for rockfish and greenlings from the ever-hunting seals that inhabit the reef.

Care should be observed when diving here as strong tidal rips and downdrafts can occur on the outside wall. The inside provides a little more protection with depths ranging from 30 to 70 feet.

Several of the protected islets and reefs around Sucia offer great diving which are sheltered from the strong currents and rough swells from the outside straits. One of the more popular of these is **Ewing Island**. It is separated from the northeastern finger of Sucia by a narrow, shallow pass. The walls on the outside of the island are a little exposed, but they offer excellent diving with a backdrop of crimson anemones, red gherkins and spindly-tipped basket stars. The lee side of the island is quite protected and fringed with large kelp beds.

Although Sucia is a remote, tranquil island paradise today, like other islands in the area it bears a notorious and somewhat colorful past as an infamous hideout for smugglers and rum runners. In the late 1800's Congress passed a bill to halt the import of Chinese laborers whose numbers in the U.S. had reached into the hundreds of thousands. Soon afterwards, as the Chinese workers legally entered Canada in search of a way into the U.S., enterprising local men with fast boats set up operations in the San Juans and Pacific Northwest smuggling was born.

Unfortunately, many gruesome acts were committed within the dark secluded hide-

aways of the islands as smugglers were pursued by Custom officials. The smugglers would often strand the Chinese on lone rocks or even dump their human cargos overboard to avoid capture. Names such as Undertaker's Reef and Sucia's China Rock are reminders to this grim bit of local past.

When prohibition hit in the twenty's, rum running became the game of choice to the local entrepreneurs. Local legends were born in the dark twisty channels of such places as Smugglers Cove and Rum Island.

Just west of Sucia Island and in the middle of Boundary Pass is a lone buoy marking the international border between the United States and Canada. **Boundary Pass buoy** is anchored on the summit of an underwater ridge that rises from over 100 fathoms to within 60 feet of the surface. Nearly a quarter mile in diameter, the plateau beneath Boundary Pass buoy is probably the only dive in the world that allows you to dive in two countries on a single dive!

The bottom is creased with a labyrinth of crevices which conceal a plethora of soft invertebrate clusters. Fiery pink crimson and brooding anemones line the fissures to resemble miniature fields of waving wheat. Giant Pacific octopus and enormous Muppet-faced wolf eels nestled into the rock lairs are a common site along the ridge.

Boundary Pass Buoy is an advanced drift dive which is exposed to ruthless tidal action and heavy seas. Divers should only attempt this dive with an experienced person and preferably with one of the local charter boats that is familiar with the site.

Beyond the southern edge of Boundary Pass and one mile off the north tip of Waldron is **Skipjack Island**. Skipjack is another one of the San Juan Islands that is protected as a

wildlife sanctuary, supporting large colonies of tufted puffins, auklets, gulls and other pelagic birds. Consequently, landing on shore is not permitted.

Just off the north shore however, is an amazing structure of grooved reefs that form long underwater hallways that dance with diverted sunlight from the overhead kelp fronds. The reef eventually drops off to smooth rock walls with patches of encrusting sponge, staghorn bryozoa and large plumose anemones. Giant Puget Sound king crabs can be found blending into the rocks by their bright purple- and orange-tipped carapaces. Often reaching over a foot across, these behemoths have large white molars lining the inside of their crushing claws.

EASTERN BOUNDARY

The eastern boundary of the San Juans is separated from the Washington mainland by Rosario Strait. Water visibility in this section of the islands tends to be a bit murkier than the rest of the San Juans because of the flushing action provided by Rosario Strait. Several rivers and streams from the nearby glacier shrouded volcano, Mount Baker, flow into estuaries in the northern part of the islands. The glacial silt and debris is captured by the tides and flushed through Rosario Strait on its way to the Pacific.

Despite the murkier conditions, many excellent dives can be found in the vicinity of Rosario Strait. Several sites in this area are popular because the close proximity to the mainland allows for quick day trips from launching ramps in Anacortes and Deception Pass.

James Island along the western boundary of Rosario Strait is an Island Park with camping sites, pit toilets and mooring buoys

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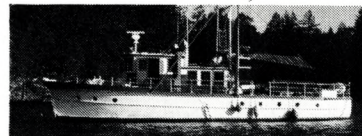
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making it a popular destination for weekend divers. The island's north side tumbles underwater into a series of cascading rock ledges which step at 60 foot intervals. The wall eventually bottoms out in 25 fathoms.

A vivid assortment of marine life blankets these current-carved ledges. Big, beautiful crimson anemones sheltering blue- and red-banded clown shrimp cohabitate in symbiotic harmony along the wall with plumose and teal anemones. Ancient cloud sponges, sea squirts and chameleon-like red Irish lords can also be found here.

A narrow cut of water flowing in from Rosario Strait and separating the southeast tip of Lopez from Decatur Island is **Lopez Pass**. Vertical rock walls fall to a mud bottom at 85 feet on the Lopez side of the pass offering some excellent diving.

The wall is covered in a display of giant sun stars, gherkins, red sea urchins and a host of anemones. An occasional sea lion can be seen working his way down the pass. Several small islets dot the head of the pass as it spills into Lopez Sound. These islands are protected and landing should be avoided.

Across Rosario Strait and hugging the mainland are several islands and rocks which offer quick day access and excellent diving. Just north of Deception Pass is a large rocky protrusion fringed by a rock reef called **Williamson Rocks**. On the north side, boulders and rocky crags border carved passageways that are carpeted with red sea gherkins, giant red urchins and plumose anemones.

Several harbor seals live on the rocks and occasionally offer divers a glimpse of their underwater antics. The summer kelp canopy gets quite thick here and provides a habitat for several varieties of rockfish and greenlings.

The reefs along the south side of Williamson Rocks is marked by a large can buoy. Although exposed to heavy current rips during tidal exchanges, slack water can offer a great excursion among thousands of crimson anemones that cover this part of the reef. Williamson Rocks is another protected area in the San Juan Wildlife Sanctuary.

Adjacent to the mainland and just off the southeast shoulder of Burrows Island in Burrows Bay is a small island which was named for Oregon pioneer Ewing Young, who taught wilderness survival to Kit Carson. The south side of **Young Island** steps off to a beautiful shallow reefscape of red sea gherkins, pecten scallops, cucumbers and fields of white sinuous basket stars. Lingcod are also abundant on the current-swept ledges along the reef. This area is a good place for beginning divers to try a little current diving with an easy run out.

The opportunities for diving in the San Juans is almost limitless. Dive charter boats leave from the mainland gateway town of Anacortes for day trips almost every weekend. For those on their own, the Anacortes ferry winds its way through the islands several times a day and stops at the four major islands: San Juan, Lopez, Orcas and Shaw. Most of the larger islands have airstrips and several charter airlines offer service to the islands from Seatac Airport and Lake Union in Seattle.

There are several dive resorts scattered throughout the islands which cater to divers offering marine facilities, accommodations boat rentals and air. Visiting divers should be well equipped as there is only one full service dive shop, Emerald Seas, in Friday Harbor on San Juan Island.

If you want to try something a little different than the typical tropics on your next diving trip, give the cold water color of Washington's San Juan Islands a try. I guarantee you will welcome the hearty diversion.



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Macro Photography

*Text and photography by
Marty Snyderman*



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Opposite Page Left: Using the sun to backlight jellyfish and other translucent or semi-translucent subjects often helps to create a dramatic image. Most translucent subjects are very difficult to film, and backlighting often produces the best results.

Opposite Page Right: This shot of fire coral was taken by backlighting. Note the rimmed halo effect created around the hair-like stinging nematocysts on the coral branches. The shot was taken with a frontlighting/backlighting combination. You can tell that this combination was used because you can still see the backlighting effect while at the same time you see the exposed details of the front of the fire coral created by placing one strobe in front of the subject.

Top: This photograph of the feeding polyps of a sea fan was taken with sidelighting. Note the halo-like glow cast around the polyps. By contrast, the image **above** was taken with frontlighting. The halo-like glow is absent.

Left: This photograph of a garibaldi was taken with a single strobe held to the side of the garibaldi's head. Note the harsh shadows created by using a single strobe.

UNDERWATER PHOTOGRAPHY

It is often said that amateur photographers spend their energy composing their frames while professionals work to control their lighting. Obviously both ingredients are important to achieve the desired final result, but there is more than just a little merit in the observation. Obviously, professional photographers don't ignore composition. If they did, they would soon need to become professionals in another field. What the pros do, however, is spend a lot of time working with their lighting to create the exact effect they want to see in their final image. The pros know that they must control their lighting in order to control their photographic destiny.

It is of fundamental importance to realize that lighting does a lot more than just provide a means of exposing film. Lighting creates a mood, and it is the impact created by the mood that so often makes the difference between a snapshot and a photograph. One-strobe lighting, two-strobe lighting,

standard lighting, sidelighting, and back-lighting all create a different look. Each look has its strengths and weaknesses in any given situation, and certainly each look is different from the others. If you can learn to use your lighting the effect you want to create and to emphasize the strengths of your subjects, then you will be well on your way to becoming the photographer you want to be.

If you read through the majority of the literature that has been written about lighting in underwater photography, you are likely to get the idea that lighting is a rather straightforward matter. Most texts advise photographers to place their light source above their subjects and off to the side at a 45° angle. This advice is good advice for many, but not all, shooting scenarios. Whether using one strobe or two, holding your light source above and to the side of your subject is referred to as standard lighting. Standard lighting is used by professionals in many situations, especially when taking portraits of reef creatures.

Most of the trays and arms for Nikonos camera systems as well as most of the arms used with housed systems are designed to help you place your strobes in a position for standard lighting. With standard lighting in a manual exposure system, exposing your subject is simply a matter of your strobe-to-subject distance. Automatic exposure systems such as TTL (Through The Lens Metering) compensate for differences in strobe-to-subject distance.

If you shoot every picture while using standard lighting, you are likely to end up with good results, but all your pictures will tend to look alike. At least the mood will tend to be very similar, even if the subjects are considerably different. If on the other hand, you change your lighting angles and incorporate sidelighting and backlighting, you are likely to add some interesting variety to your work.

ONE STROBE OR TWO

Perhaps the most commonly asked question about lighting in macro photography is whether a photographer should use one strobe or two strobes. The answer is that both systems have their advantages and both have their disadvantages. The advantage of a single strobe system is simplicity. You have less gear to deal with, less

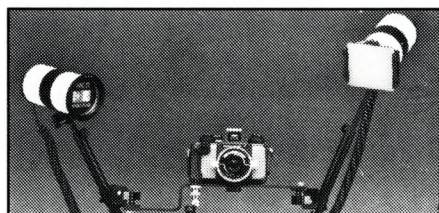
equipment can break or malfunction, and it is often far easier to get the system into cracks and crevices in the reef. In addition, your strobe is connected in-line, or in direct electronic communication, with your camera. When you trip the shutter, you also signal the strobe to fire.

There are three primary disadvantages to a single strobe system. The first disadvantage is that if you hold a single strobe out to the side of your subject, you will often end up with harsh shadows in your image. The shadows are especially distracting when you are trying to photograph a dark subject such as a moray eel in a crevice. In crevices and caves there is almost no natural light that will help provide light for exposure. As a result, the side of the eel that is opposite your strobe is heavily shadowed and in many instances, the shadowed side appears to be totally black. Morays are rather dark subjects, and what you end up with is a dark subject that gets absorbed or "lost" in a dark background. The use of a second strobe to fill in the shadowed area can be a major advantage of a two strobe system.

The second disadvantage of a single strobe system is that if you move your strobe to a position directly over your lens to try to eliminate the harsh shadowing, you often end up with flat lighting and flat images. Soft shadows can help create a three dimensional look in your images, and these shadows are often completely eliminated, or almost completely eliminated, by the direct frontal lighting created when the light from a one-strobe system is placed immediately in front of your subject.

Images lit with direct frontal lighting tend to look two dimensional and less interesting. Of course, photographic images are two dimensional. In a photographic transparency there is height and width, but no depth. Anything you can do to create the illusion of the third dimension, depth, will usually make your images far more interesting. Lighting your subjects from the side often helps create this illusion, but with a single strobe system harsh shadows are the price you often pay with sidelighting.

The third significant disadvantage of a single strobe system is that if you move your strobe to a position directly over your lens, backscatter often becomes a terrible distraction. Backscatter is a term that de-



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scribes the illuminated, out-of-focus particles in a photograph. It is almost always a distraction. Backscatter is the result of your strobe illuminating, and thus drawing attention to particles of sand, plankton, and other debris that is suspended in the water column. As a rule, the most distracting backscatter results from illuminated particulate matter that is suspended in the foreground of your shot in front of your subject.

Even if you are extremely careful in your movements when you approach your subjects, some particles will be suspended in the water column when you trip the shutter. No one can magically make them disappear, but we can all try to reduce their impact. Lighting from the side tends to lessen the negative impact caused by suspended particles because the light they reflect from your strobe does not bounce back directly toward the lens and the film plane. A lot of the light will bounce back in the direction it came from, to the side.

Another technique which can help reduce the negative impact from suspended particles is to shoot slightly down on your subjects so that the background is reef, not water. Certainly this technique goes against the proverbial book. In most literature printed about underwater photography, we are advised to get down and shoot up toward our subjects in order to emphasize the subject and create a pleasing dramatic effect. I am not refuting this part of the concept. On the contrary, I try to shoot at a slightly upward angle every time I can. In clear water, I shoot at a slightly upward angle almost 100% of the time.

But in water where visibility is severely reduced by suspended particles, shooting at a downward angle will help cause these particles to blend into a background that is the same color, or nearly the same color, as the suspended particles. For example, light colored particles are likely to blend into a background of sand if you shoot at a downward angle. The same light colored particles will likely stand out in distracting fashion against the dark water backgrounds that you so often get in macro images. Even during the day, bright blue water usually goes dark in macro work because you are shooting with the smallest possible aperture to maximize your depth of field.

The point to remember is that in shooting situations where visibility is a problem, try shooting down towards a bottom that is the same color as the particles that are suspended in the water. And try your best not to frame suspended particles against a background of contrasting color.

Two-strobe systems enable you to place one light to either side of your subject. This technique can help eliminate harsh shadows and create a three dimensional look, but the systems are bulkier, making it more difficult to get your camera system into position in the tight quarters of a reef in some instance. And you have more chance for equipment failure because you have two strobes instead of one.

In many two-strobe systems the second strobe is not connected by hard wire to the camera. Instead this strobe depends upon a sensor that detects a sudden change in light which makes it fire. The sudden change in light is, of course, created by the light of the key strobe. The sensor in the second strobe, the slave strobe, detects the sudden change of light which causes the slave to fire while the shutter is still open. Some sensors are more sensitive to the instantaneous light changes than other systems are, and some slave sensors do not function well in bright waters. For this reason, most slave strobes work better at night. The point is, making a slave strobe fire when you want it to is not as simple as just buying a strobe and using it. The slave sensor must be sensitive and it must be able to "see" light from the key strobe when it fires.

By being able to light your subject from opposing sides with a two-strobe sys-

tem you are able to reduce harsh shadowing. At the same time your sidelighting will likely reduce backscatter as well. However, you must be careful not to overexpose your subject, or the foreground, with either strobe. By contrast, a slight underexposure in the shadowed areas often enhances the three dimensional effect. In fact, that is what photographers usually try to do in studio settings when they can be in complete control of their light. When shooting portraits of reef creatures, advanced underwater photographers are simply trying to create a studio lighting effect underwater by using two strobes. In doing so, the photographer is being careful to control their exposure with their key strobe and to soften shadows with their second strobe which is usually a slave.

The main advantages of two-strobe lighting are creating a three dimensional effect, reducing harsh shadows, and reducing backscatter. These advantages can be very significant. I've found that it is usually best to use two strobes in macro situations, but it is of fundamental importance to have a very clear understanding of the problems a one-strobe system creates. If you do not understand what the problems are with a one strobe system, it is difficult to understand exactly what you are trying to accomplish with a second strobe.

THE EFFECT CREATED BY SHADOWS

As a rule, soft shadows enhance photographs. This fact seems to surprise many photographers. Let's take a look at what shadows do. Shadows help orient viewers and they help provide the illusion of a three

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UNDERWATER PHOTOGRAPHY

dimensional image. Shadows look natural, and they make viewers comfortable. We see shadows almost all of the time whether we are indoors or outdoors. In almost every setting we are in, lighting comes from above and shadows are cast downward. We acclimate easily to settings where shadows are below subjects because the settings are what we are used to. Photographs that incorporate the use of soft shadows help viewers get oriented with which way is up and which is down. Harsh shadows, on the other hand, often rob us of details in an image.

If you eliminate shadows, viewers tend to have a difficult time getting oriented. They can't tell up from down, and the effect is usually very distracting even if viewers can't tell you why. The three dimensional look that shadows help create is usually lost.

Some photographers try to completely eliminate shadows because they believe doing so will enhance their efforts. These photographers often use three or more strobes, all strategically placed in an effort to take a picture without shadows. Usually these photographers end up fighting their gear during their dive, and all they get for their efforts is a disappointing image as a final result.

SIDELIGHTING

Sidelighting involves placing at least one strobe at an even more radical angle to the side of your subject than in standard lighting. In sidelighting, the strobe is held in, or almost in, the same plane as the subject at an angle of 60 to 90 degrees to the film plane. The strobe is then aimed toward

the subject. Sidelighting can add to the three dimensional effect by creating pleasing shadows which add texture to your images, and it can help cast a halo-like glow around your subject.

However, sidelighting does not work well for all subjects. Foreexample, if you are using a single strobe system and you are filming a typical reef fish such as a garibaldi or angelfish, sidelighting is generally a poor technique because of the harsh shadows created by the extreme lighting angle. As a general rule, one strobe sidelighting does not work well for large solid subjects such as fish or sea stars.

By contrast, sidelighting can be a very effective method of lighting a macro shot of the surface of a coral head, feeding coral polyps of hard corals, sea fans, and semi-translucent or translucent creatures such as jellyfish. Usually a little experimentation is required to learn what subjects are good candidates for sidelighting.

As a general rule, the best subjects are small enough that the sidelighting can create a pleasing rim of light around the subject, or the subjects are transparent, or at least semi-transparent. There are, however, many exceptions to that rule. Some of the most interesting side lit subjects are close-ups of coral heads with the polyps retracted. The sidelighting tends to add interesting textures that are lost in images where direct frontal lighting is used. Yet the surface of coral heads are neither small enough to create the halo effect nor are they translucent.

Strobe placement also requires practice and some experimentation. An excellent technique is to hold a sidelighting

strobe a little farther away from your subject than when you use direct frontal lighting. Remember results will vary significantly from subject to subject. The best method is to vary your strobe-to-subject distance, and to thoroughly bracket each subject.

BACKLIGHTING

Backlighting can also be a very effective technique in macro photography. When backlighting, the goal is usually to enhance your subject by creating a halo effect behind or above your subject. However, with some transparent or semi-transparent subjects such as jellyfish and salp chains, backlighting is a good way to show detail in your subject. Jellyfish can make wonderful photographic subjects, but they can be difficult to light. Standard frontlighting rarely produces the images we expect to get. However, backlighting can often help illuminate details in partially transparent subjects.

The question of where to place your strobe when you backlight is a difficult one to answer as the best placement usually varies from subject to subject. When backlighting with a single strobe camera system, your strobe is held behind your subject and is pointed toward the lens. However, with direct backlighting you must be careful not to flare the lens by placing the strobe too close to your subject while pointed directly at the lens. Flaring the lens yields large splotches of white light in your image. These blobs of light are usually very distracting.

The desired effect from backlighting is usually to create a pleasing rim of light around your subject. But creating this rim of light without flaring the lens is not as easy to do as it is to write about. Several good techniques are to hold your strobe behind and below, behind and above, or behind and to the side of your subject. Then point the strobe directly toward, or just slightly above or to the side of, your subject. In strict terms, what we commonly call backlighting is often a combination of sidelighting and backlighting.

In my experience, I have found that the best thing to do is to bracket my exposures by varying my strobe-to-subject distance. Even after all these years of shooting, I

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usually bracket with far more exposures and strobe-to-subject distances when back-lighting because I can not see exactly what my lighting is doing. As a rule, when backlighting I hold my strobe about twice as far from my subject as I would when frontlighting. For example, if I use an aperture of f/11 when frontlighting with a strobe-to-subject distance of one foot, then I would hold the same strobe two feet behind my subject when backlighting while using a f/stop of f/11. Then I bracket this exposure.

A key to success is to bracket thoroughly by varying your strobe-to-subject distance or changing your aperture, and to shoot a lot of film. After you gain some experience with your strobe system and you see the results you obtain with certain subjects, you will start to get a feeling about the strobe-to-subject distances that work well with those subjects. But the best advice I can give is that if you find a subject that you want to backlight, thoroughly bracket your exposures. You might be able to get a feel for backlighting, but 100% accuracy is impossible. Bracketing is possible, and it is a key to successful backlighting.

If you are using a two-strobe combination with one-strobe frontlighting and the second strobe backlighting your subject, the task of achieving the proper exposure requires a lot of film and plenty of discipline. You should use a minimum of three exposures with your frontlighting strobe to be sure the front portion of the image is exposed correctly, and then with each of those exposures you should use several backlighting brackets as well.

As an example, let's say you find a feeding sea fan and decide to take a backlit macro shot of the polyps by using a two strobe system. Let's say that your strobe-to-subject distance is one foot, and with your selected film and camera system an aperture of f/11 is what you normally use from one foot. Start by placing the frontlighting strobe above and to the side of your subject at a strobe-to-subject distance of one foot. Then take a series of shots using f/11 but vary the backlighting strobe-to-subject distance on each shot. Expose the first frame with the backlighting strobe held 24 inches behind your subject, the next

shot with this strobe 30 inches away, and the third shot with the backlighting strobe-to-subject distance of 36 inches. Next leave the frontlighting strobe in the exact same position, but change the aperture to f/16 as you expose frames with the backlighting strobe at distances of 24 inches, 30 inches, and 36 inches away. Then repeat this same procedure with an aperture of f/8.

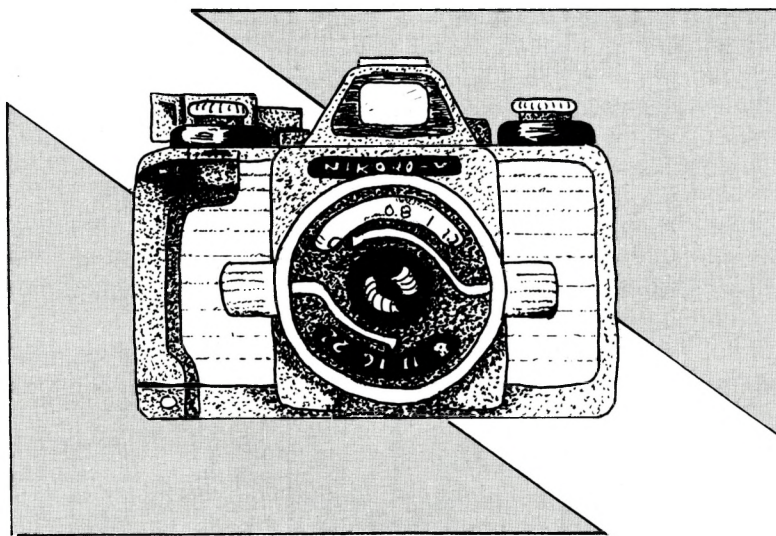
Somewhere in the mix you should get just the image you want. Actually you are likely to get several good images, all of which have a slightly different, though pleasing, look. And despite all that effort, don't be surprised if you need to analyze your film and come back and try to recreate the setting using slightly different exposure techniques another day.

Another way to provide an interesting effect through backlighting is to use the sun to backlight your subjects. A burst of

sunlight directly behind your subject can create a very dramatic effect. In order to use the sun to backlight, you will probably be working with subjects that are floating in the water column. Translucent or semi-translucent subjects such as jellyfish generally work well.

Understanding and controlling your lighting are definite keys to controlling your own photographic destiny. Begin with standard lighting and a one-strobe system and as soon as you gain a solid understanding about how to create the lighting effect you want with that system, then begin to try a two-strobe system and techniques such as sidelighting and backlighting. Carefully analyze your results. Make the necessary adjustments, and you'll be on your way to becoming the underwater photographer you want to be.

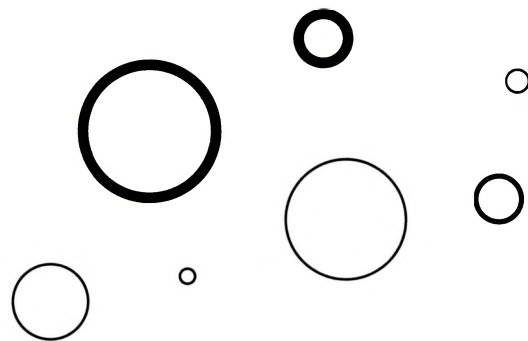
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Compressed Comments On O-Rings

by Michael Dunning



O-rings? Yes, O-rings. Boring, you say? Maybe not so. You should learn to love O-rings. Maybe we should form an O-ring Appreciation Society. How about bright, color coordinated sweatshirts or t-shirts with multi-colored O-rings all over the front or maybe the back, that is if you do not wish to "affront" your friends! Maybe a car bumper sticker "A Diver's Best Friend is an O-ring" or "I'm into O-rings." I think the best one would be "Don't Abuse the O-ring" because, dear diving friends, that is the crux of the matter – Abuse. How it crops up in the human society in practically everything we do, even diving. So I have to push on with the topic, and that is, as you have guessed... O-Rings!

Under normal circumstances most divers only see one O-ring, and that is the one in the tank valve. That's fine because it is the only one that normally comes under the direct control of every diver using scuba gear. The idea is that you should normally check the tank valve O-ring before fitting your regulator. The question I am asking you is "What do you check for?" If it is your own tank, then hopefully you should know the tanks history, and that of the O-ring. Is it the right size for the valve? I am quite amazed at the number of tank valves I have seen with the wrong O-ring fitted. There are approximately five different sizes in use, as well as different types of rubber material. All those O-rings have a number of differences, including the outside diameter, inside diameter and cross section diameter. It is important to note that a tank valve is designed and manufactured with a specific size of O-ring in mind. No other O-ring should be fitted than the one specifically required for a particular valve, even in the event of an on site emergency (like blowing an O-ring when fitting and testing

the regulator). If you compromise by fitting one offered by someone else because you do not have a spare one, then you are compromising both your life and the life of your buddy somewhere along the way!

So getting back to the original point, what do you check for? Obviously the first thing to check is, is it there? Can you see it?

After that, please take the extra few seconds it takes to turn the cylinder to the light to check the condition of the O-ring. Is it dirty, dried out (looks like a matte finish), cracked, or squashed with feathered edges? Any or all of these can and inevitably will lead to a blow out. While it may only be a year off your life due to the shock if it blows off on the surface, it could be your life, period, if it blows off underwater. Does that seem strong? Remember it can happen, and remember there are novices and inexperienced divers out there who may not know how to deal with a blown ring underwater. All you "experienced" divers out there "Look to your Laurels" and use your knowledge and experience to help yourself and others wherever you are. The main point is that there is a tremendous lack of knowledge about what O-rings actually are, what they do and how they do it (whatever it is they are supposed to do! Could this be material for a best seller?).

Basically an O-ring is there to hold in, or out, or both, air or water at high or low pressure. This is normally achieved by seating the O-ring in a channel in a position that it will be slightly compressed by the fittings around it when the parts are assembled, as in regulator-to-tank valve. If the O-ring is too big for the channel it is compressed too much and extrudes over the edges of the channel, thus preventing the fittings from mating together properly (told you this had the makings of a best

seller!).

The consequence of this is that as soon as you apply pressure (as in 3000 psi tank pressure), the O-ring immediately does an escape act through the gap left between the fittings. With, of course, results which I am sure you are all familiar...

The other side of the O-ring story is fitting an O-ring that is too small. Using the same premise as before with the tank and valve, when you apply pressure, you get an immediate leak, maybe fairly small. So your remedy is usually to turn off the tank, bleed the air and screw the A-clamp down as hard as you can. Wrong! Wrong! Wrong! You may stop the small leak by the virtue of grinding one metal face into another (you vandal), and it may last the whole dive and be a distant memory after the second beer. But the damage you have done will catch up with you some time in the future. It is important to remember that the O-rings in your equipment, wherever they are fitted and irrespective of whether they are high pressure or low pressure, will only do their job if they are the right size, in the right place. "Screwing the Nut" as the saying goes, will not help them to do a better job but probably give you a nasty headache!

Well, back to the start of this article. Respect your O-rings. Give them some T.L.C. (for the unknowing that is Tender Loving Care). They will reward you with safety and longevity. So wave the banner, "Save The O-ring Today and It Will Love You Tomorrow"... when you're at 130 feet.

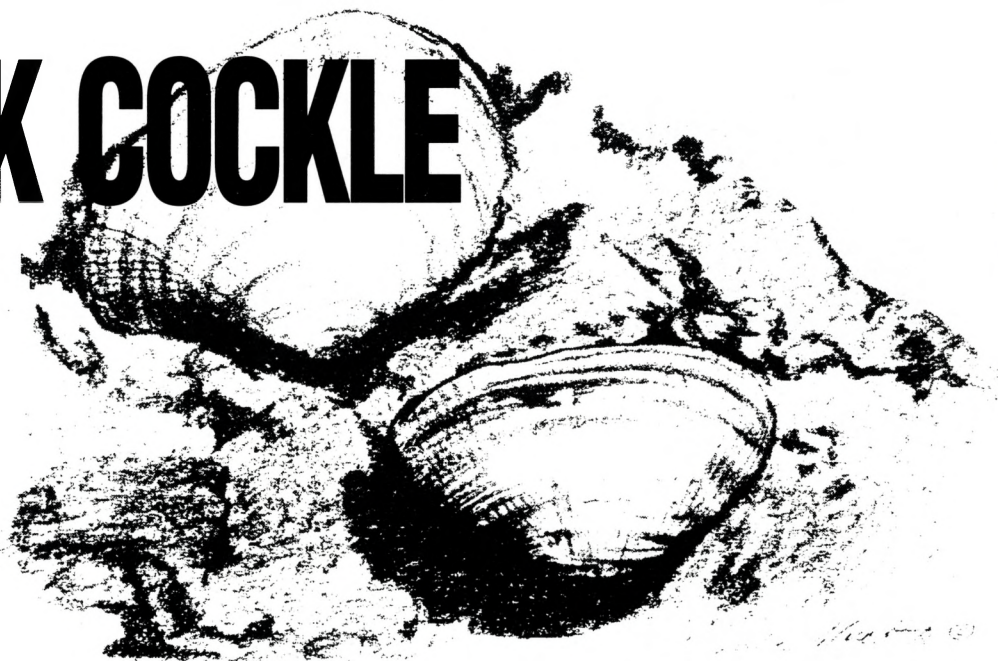


Michael Dunning is the Florida State University Diving Engineer.

THE ROCK COCKLE

TAXONOMY

Kingdom:	Animalia
Phylum:	Mollusca
Class:	Pelecypoda (Bivalvia)
Order:	Veneroida
Family:	Veneridae
Genus:	<i>Protothaca</i>
Species:	<i>staminea</i>



by Robert von Maier

If you happen to be a fancier of seafood delicacies, you may very well have eaten the subject of this issue's column - *Protothaca staminea*. (Sorry Tab, and all you other loyal vegetarians.) If you have, stay with me and find out what it is that you consumed. If you haven't, read on anyway, you've just as much to gain.

First described in 1837 by Conrad, *P. staminea*, commonly referred to as the rock cockle, is not a true cockle. It is technically a clam, and along with its relatives - mussels, oysters, cockles, scallops, shipworms, etc., it is a member of the class Pelecypoda, or Bivalvia. (It is called a cockle because of the cockle-like, radiating ridges found on its valves.) The class consists of approximately 15,000 species, more than 80% of which are found in the marine environment. The overall morphology (body plan) of pelecypods is well-adapted to a life of burrowing. They are composed of two convex body parts, or valves, that are hinged together and give the animal a hatchet-like shape. In fact, the term Pelecypod means "hatchet foot" in Greek.

As is commonplace with many other species, the rock cockle is known by a variety of names such as the common Pacific littleneck clam, the hardshell clam, the rock clam, and the Tomales Bay cockle. It has a habitat range that extends from the Aleutian Islands to Baja California, and is commonly found between the high and low

tide lines or in water that is slightly deeper. Rock cockles, like most clams, live buried just under the sand in burrows that are usually 25-76mm (1-3 inches) deep. They prefer a substrate made up of sandy, muddy materials, but are occasionally found in gravelly sand on open, rocky coasts. Due to their relatively poor burrowing abilities, they are never found in shifting sand, where rapid, efficient digging is essential to survival.

As the abundance of common names would suggest, *P. staminea* is well-studied and widely known. In several areas of its habitat range it occurs in great numbers and at locations such as Tomales Bay is exploited as a commercial food source.

Another clam of the genus *Protothaca* that could, to the untrained observer, be confused with *P. staminea* is the Japanese littleneck clam. As stated in **Between Pacific Tides (Fifth Edition)**, "The Japanese littleneck clam, *Tapes japonica* (*Protothaca semidecussata* of some authors), was accidentally introduced to our coast in the 1930's (perhaps earlier), presumably along with the Pacific oyster, *Crassostrea gigas*. The clam is now abundant in San Francisco and Tomales Bay and in Puget Sound, where it has become important commercially, with approximately a million pounds harvested annually in the late 1970's. Somewhat smaller than its relative *Protothaca staminea*, it is considered to have a better

flavor than the native species."

Rock cockles rarely exceed a length of 7cm (2.8 inches), although larger specimens can infrequently be found. Coloration varies from whitish to brown, with angular brown markings. The shell exterior typically exhibits geometric patterns made up of wavy brown lines, but may be unicolorous.

The literature states that in the waters of British Columbia and Alaska, where the clams are abundant, spawning occurs during the summer months. Growth of the young clams is quite slow, with factors such as water temperature and food supply influencing their growth. The age of the animals can be determined by annual growth lines in the shell.

Rock cockles may not evoke exciting, awe-inspiring images like sharks, eels, or Larry Cochrane, but as marine creatures who've stood the Darwinian test of time (not to mention their importance as a food source), they deserve attention just the same. The next time you order a bowl of clam chowder, say a prayer for *Protothaca staminea*.

Author's Note: For additional information about the rock cockle as well as other members of the genus *Protothaca*, refer to **A Field Guide to Pacific Coast Shells** by Percy A. Morris (Second Edition).

A Dive Into History...

Missouri's Bonne Terre Mine

Text and photography by Joe Belanger



Above: The Lake Room is said to be the clearest dive in the mine.
Right: The submerged railway system reminds divers that they are truly in a different world.

What used to be solid rock, Doug and Cathy Goergens now call "The Billion Gallon Lake". It is also referred to as "Deep Earth Diving" and "A Dive Through History". It's time-held secrets have attracted such notables as the Cousteau crew, ABC, People Magazine, USA Today and the Discovery Channel. Its tomb-like atmosphere is eerie, yet peaceful, tranquil and beautiful. It's not a lake, cave, or wreck, yet its setting is representative of all these environments. It's a dive to the center of the earth, and that could mean only one place: Missouri's Bonne Terre Mine.

The history of the Bonne Terre Mine is intriguing. It was once the largest lead mine in the world. Although gold and silver were initial targets, French surveys in the 1720's revealed that the earth below the town of Bonne Terre contained significant amounts of lead. This caught the attention of a mining pioneer, Charles Parsons, who in 1867 formed his own company, which he called St. Joe Lead. They eventually owned and operated several mines in the area, including the Bonne Terre Mine.





Top: The mine is supported by giant stone pillars, a mining technique called the room and pillar method.

Above: Ore chutes are common throughout the mine, both above and below the water.

Right: A guide examines a dynamite crate.



What makes the Bonne Terre Mine so unique is its size and the fact that it is entirely man made. St. Joe lead actually built the mine from the bottom up, using a mining technique called the "room and pillar" method of mining. After sinking the first mine shaft, miners would use dynamite blasting caps to remove veins of lead. As the size of the mine increased, ceiling support became necessary. Giant stone pillars, spared from the blasting, were left staggered throughout the mine to give such support. The end result was a cyclopean chamber—five levels of mine, nearly two football fields deep, filled with hundreds of huge oak tree-like pillars and miles of serpentine passageways.

Although the Bonne Terre Mine was for decades a profitable venture for St. Joe Lead, time and history took its toll. The demand for lead began to dwindle early in 1960. By 1962, the demand ceased and the order to close the mine finally came. The miners, discouraged and out of work, left most of the antiquated mining equipment behind, as well as shacks they used as office space. The pumps used to drain natural seeping spring and rain water, however, were removed. Water continued to make its way through the porous bedrock, eventually flooding most of the mine, and created the world's first aquatic graveyard of mining artifacts. Unknown to St. Joe Lead, they had left behind a time capsule, waiting to be re-opened and shared with the rest of the world.

For some time, Doug and Cathy Goergens, who are owners of West End Diving Centers, had been searching for the ideal dive site, so they may offer their clientele class diving. In 1978 they found such a place, the Bonne Terre Mine. They finally obtained the rights to the mine in 1979. Their vision of an ideal dive site, unique in all the world, was about to come to fruition. First, however, began the long and tedious task of developing it into a world-class diving destination. Two hundred and fifty thousand watts of quartz and high pressure sodium lights were installed throughout much of the mine. This was no easy task when you consider that the whole town of Bonne Terre could actually fit inside. A spacious diving platform, which took nearly 80,000 board feet of lumber, was constructed. They also installed a fill station on the 5,000 square foot dive platform. Although only one very large compressor is actually needed, three are available so that air fills are not jeopardized due to compressor failure.

After the renovation was completed, the Goergens' put their diving staff through a rigorous, well designed training program. The mine was now ready for its debut. In 1981, Doug, Cathy and their staff "uncorked" the mine, opening the doors to the diving public. Though the mine is just 62 miles to the southeast of St. Louis, divers from all over the country have been drawn to the awe-inspiring "Deep Earth Diving" of Bonne Terre, an attraction that, four years earlier, was only a dream of Doug and Cathy Goergens.

From the start, the Goergens' knew that a crucial ingredient in the success of the new Bonne Terre Mine resort would be good organization. Every aspect, from scheduling and briefings to dive tours, is carefully planned.

To keep track of divers visiting the mine, arriving divers must check in at the dive shop near the old mule entrance. Your driver's license and C-card are checked and held by the staff until the day of diving is finished. The guides also like to take a look at your log book; it gives them an idea of your experience. Not to worry! No matter what level of diver you are, the guides are trained to make sure everyone has a positive and unforgettable diving experience.

After receiving your schedule, you meet with your dive guide and safety diver for a briefing. There are two simple rules: No dive lights are allowed on any of the dives and no cameras are allowed on the first dive. The safety diver and lead diver use light-signals for communication. Too many lights in the water would make communicating difficult. Also, dive lights tend to take away from the magic of the mines ambiance. On the first dive, you're required to demonstrate use of safe second and mask clearing. For this reason, cameras must be left behind. The staff also feels the first dive should be a "get acquainted with the mine" dive, a rule that's important to follow when diving unique terrain such as the Bonne Terre Mine.

Your guides also explain every detail of the dive, using a map of the mine's trails. They describe exactly what you will see and where you'll see it. If you're a photographer, the guide will be very helpful. The most scenic parts of the mine will be pointed out and if you need a model, don't worry; these guides are all ready and willing hams. Although you may have a different dive guide for each dive, all have positive, helpful attitudes. That's because Doug and Cathy select their dive guides not only for their knowledge and skills, but for their enthusiastic and warm

personalities. They're there to help in any way they can. One guide even helped me find my way to the post office, a small but enthusiastic gesture.

Bones, the dock-master, is the nucleus of the team. He makes sure the docks are never crowded. Although there may be dozens of divers visiting the mine on the same day, Bones oversees the scheduling, ensuring that your small group has a specific area on the dock. That's no easy task since the mine is open for diving only on weekends, and the number of visiting divers is steadily increasing. Remarkably, 15,000 divers dived the mine last year alone.

Once the formalities are over, it's time to go diving. Divers carry their gear down the old mule trail, the same trail mules used when hauling one ton ore carts in and out of the mine. Your first impression upon entering the mine will be one of amazement. Its size is mind-boggling, especially when you consider its man made origin. The size of the mine is an unbelievable 35 square miles, with 17 miles of navigable shoreline in the lake alone. It's nearly 500 feet to the bottom, 400 of which is underwater. If you can picture 100 Superdomes partially filled with water, then you have a good idea of its size.

Unlike other dive resorts, weather does not affect diving conditions at Bonne Terre Mine. Outside, it could be below freezing or hot and windy, but conditions inside the mine remain the same all year long. A naturally controlled climate, the temperature is always 62 degrees, and the humidity approaches 80 percent. The mine's temperate climate is such that you may hear Bones order a cup of hot coffee despite an outside temperature of over 100 degrees.

The water temperature also remains constant at 58 degrees. The water itself is pure and palatable. The bedrock acts as a natural filter, cleansing the water as it percolates through. If you get thirsty, you could actually take out your regulator and have a drink! It is this filtering process that makes the water exceedingly clear. Visibility always exceeds 100 feet and has been known to reach 200 feet in areas such as the Lake Room. But, what makes diving here even more appealing is the lack of current and surge, resulting in the calmest of calm and purest of pure diving conditions.

Currently, there are 25 different trails to dive, but the Goergens' are constantly ex-

REFRESH YOUR SKILLS

Now is the time to brush-up on your scuba skills and make sure all of your dive gear is in proper working condition. Visit a dive



center near you for the latest information on upgrading your skills, new scuba equipment and exciting dive travel opportunities.

A message from this magazine and the
Council for the Promotion of Scuba Activities

ploring the mine for new, innovative sites. First time visitors start with Trail One and work up. For example, the first weekend package offers five dives: Trails One through Five. Then on your second visit, you may dive Trail Six through Ten, and so on. However, it doesn't matter which trail you're on to enjoy the historical ambiance of the mine. Each one offers a unique flare which becomes permanently affixed in the back of your mind.

Trail One was the dive that did it for me. Swimming past rusted ore carts, an abandoned jackhammer and part of the railway system left me awed, as if finally sank in that I was actually diving a lead mine where men once labored by the lights of tiny flickering lamps. On the other hand, on trail two you get to swim through the "Keyhole", an eccentric hole cut between two areas of the mine and used as a shortcut—it's indeed an experience of a lifetime! The structure on Trail Four is also a site not be missed. It's a huge structural ore elevator, with massive beams seemingly strewn about, making divers appear minuscule in comparison.

As you're diving the mine, you will also understand why a guide is necessary, as they take you through the many labyrinths of a trail. The feeling is awesome and majestic, as your guide leads you off a ledge into a twilight of infinity. Conversely, keep an eye on your dive guide's light, because there are areas of the mine that come alive with color. Before it flooded, water seeping through the bedrock left behind beautiful mineral deposits. Now divers have the chance to see calcium formations called "Cal Falls", which look like white yogurt spewing out from the bedrock. One calcium formation was mixed with iron deposits, making it look just like a giant fudge sundae. Blue and green streaks left by other types of trace metals are also common throughout the mine.

Another focal point of the mine is the railway system you'll see. It was used to move the one ton ore carts to ore chutes scattered throughout the mine. There are also stairs plummeting to depths over 100 feet, almost making you forget you're underwater. Dynamite casings shroud one of the ceilings of overhang on trail two. Viewing these mining implements create the feeling of being in a submerged ghost town; you can almost hear sounds of blasting, hammering and the yells of "fire in the hole" that, 28 years earlier, were a reality.

If you're interested in further saturating your mental palate with information on the mine, the Bonne Terre Mine Resort offers both walking and boat tours. For non-divers, this will give them a good idea of what their scuba diving counterparts see. The walking tour is a detailed excursion through a representative part of the mine. The guides give you a good historical description of the mine and its artifacts. You'll get a birds-eye view of massive ore chutes and steep drop-offs. They will point out calcium deposits, ore samples, ore carts, tipples (what's used to tip ore carts) and much more. Be sure to bring along your camera; there is a lot to take pictures of!

The boat tour takes you to areas like the 1095 air shaft, one of two opening in the mine. The boat you'll be sitting in was actually lowered into the mine through this shaft. While moving along, you will slowly motor past the giant ore elevator, a structure that descends nearly 500 feet from the surface. You will also see scaffolding still hanging in parts of the mine. These tours allow the opportunity to blend some education with recreation in mid America's favorite dive getaway.

When the day of diving is done, you will probably want to go relax in your hotel. West

End Diving offers pleasant accommodations, including the famed Mansion Hill Country Inn, which used to be the estate of St. Joe Lead. Now owned by Doug and Cathy, it has been converted to a top-notch Country Inn, offering good service, gourmet meals, a relaxing atmosphere and comfortable rooms. In fact, the Mansion Hill Inn has been nominated to the National Register of Historic Places. The Goergens' have also converted the old train depot for guests to stay in. Named the 1909 Depot, it is a National Historic Site, and has been decorated in turn of the century motif. It has seven very comfortable rooms and a well stocked bar downstairs called the Whistle Stop Saloon. Both inns offer superb accommodations, so you can't go wrong by choosing either one.

The towering historic atmosphere of the mine, the artifacts, the passageways, the giant pillars and the Bonne Terre staff all add up to one entity: some of the best and most unusual diving in the world! If you're interested in making "A Dive Through History", contact West End Diving Centers at 11215 Natural Bridge Road, Bridgeton, MO 63044 or call (314) 731-5003. Remember, Bonne Terre means "good earth", and good earth is exactly what it offers!

IMPORTANT SAFETY NOTICE

U.S. DIVERS REGULATOR RECALL

U.S. DIVERS CO., INC. has extended its voluntary recall to include all regulators purchased or serviced since July 1, 1988. A potentially hazardous problem may exist with the high pressure seat in the first stage that may result in an uncontrolled free-flow of air that could make it difficult or impossible for the diver to breathe off the second stage. If this occurs during a dive, use of the product could be hazardous.

DO NOT DIVE WITH THIS REGULATOR

Failure to heed the warning may result in serious injury or death.

If you purchased a U.S. Divers regulator or had your U.S. Divers regulator serviced during this period, you are requested to return your regulator to the nearest U.S. Divers Authorized Dealer for a free inspection and, as necessary, replacement of the high pressure seat.

For further information, consumers may call 1-800-635-3483, Ext. 4210

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SHIPWRECK DIVING

By Daniel Berg and Steve Bielenda

Wreck diving is a specialized area of scuba diving that can be enjoyed in all areas of the world at many different experience levels. In the Caribbean islands, traveling tourists can dive and photograph beautiful shipwrecks in crystal clear waters. For the most part, these wrecks, as well as many others, require only standard equipment and scuba skills. Off the east coast of the United States divers can visit sunken German U-Boats, tug boats, destroyers and sailing ships. This type of wreck diving is more advanced, so depending on the depth, clarity, and condition of the wreck, special skills and equipment are needed to make the dive as enjoyable and as safe as possible. Shipwrecks enable divers to visit the past, each wreck is a time capsule waiting to be explored. Divers also make interesting artifact finds while wreck diving. This enables the scuba diving community to make its own contribution to historians and archaeologists by giving them the necessary information needed for wreck identification and further research.

The equipment used in wreck diving will vary from location to location. On shallow wrecks a single tank of air may be sufficient, but on deeper offshore shipwrecks, double tanks plus a pony bottle will be necessary. Diving in the warm waters of the Caribbean may only require a bathing suit or short wetsuit where New York and Northeastern coast divers often choose to wear dry suits year round. Take into consideration as we discuss equipment needed for wreck diving, we want to streamline our equipment to reduce drag, permit easier swimming, lessen fatigue and eliminate the possibility of becoming snagged.

Good wreck diving equipment consists of necessary thermal protection for the area, safety equipment needed for depth, and whatever other gear is needed to safely dive your plan. For



Photo by Daniel Berg

Denise Berg explores the wreck of the Minnie Breslauer in Bermuda.

The first time a diver descends to explore a shipwreck his/her mind is usually filled with thoughts of finding treasure or the skeletal remains of the ship's lost crew. What the diver usually finds is a wonderful underwater habitat teeming with marine life. The excitement of diving into history to explore the nostalgic value of a shipwreck is always

thrilling and ever-changing. In fact, there is no experience equal to that of slowly descending into the quiet sea, with only the noise of bubbles around you and then suddenly seeing a large vessel sitting alone in the sand, seemingly inviting all divers to explore its remains. It is this type of adventure that entices thousands of divers each year to dive shipwrecks.

example, if a diver is planning a dive to 100 feet to penetrate and photograph the wreck's interior, he will need the proper supply of air which double tanks would provide. For his penetration, he will need a tether line reel, a main light, back-up lights, dive knives and most importantly, the knowledge, experience and mental attitude to function in an overhead environment. Lastly, he will need camera gear. All the equipment must be placed so it is easily accessible and will not dangle from the diver, possibly causing the diver to get snagged on pieces of steel or wood he swims over. There are few hard-fast rules regarding the location of items such as back-up lights and line reels, but all divers should carefully plan where each piece of gear is to be placed. For example, a back-up light is useless unless it can be easily and quickly located in the worst conditions. Let's start by examining some basic dive equipment, and modifications to equipment, for this exciting sport of wreck diving.

THERMAL PROTECTION

It doesn't matter what area or type of wreck you're diving, some sort of thermal protection will surely be worn. Note that most shipwrecks look like huge junk yards scattered across the ocean floor. This wreckage is anything but delicate on thermal suits, especially in the knee area. Bill Campbell, a good friend of mine, started to wear knee pads made from car tire tubes over his suit. He found that this simple addition to his dry suit or wetsuit doubles the life of the suit and save quite a bit of money over the course of a few years.

GLOVES AND MITTS

When gloves or mitts are worn the abrasiveness of wreck diving can usually be noticed on the finger tips. After only a few dives, chunks of neoprene seem to vanish leaving only cold bare flesh to face the elements. To increase the life of neoprene gloves or mitts, I recommend using aqua seal glue on the finger tip areas of gloves. Be careful not to apply too much glue or you will lose dexterity as a result of the stiff hardening substance. To properly apply, squeeze a small portion onto a paper plate and use a plastic knife to spread the glue onto the desired areas. Without any delay, scrape off as much of the glue as possible leaving only a thin abrasive resistant coating that will easily double, if not triple, the life of your gloves.

DIVE KNIVES

It is essential for all wreck divers to wear a dive knife, and it is recommended to have a back-up knife. Almost any manufacturer's knives will do, but bear in mind, you get what you pay for. A medium-sized blade, solidly constructed with some portion of the blade serrated is my preference for a main knife. The serration allows easier cutting of heavy rope. I wear a small, sharp back-up knife attached to my gauge console. The main important distinction, or adaptation, that must be performed to any store bought knife is that a wreck divers knife must be very sharp at all times because we encounter monofilament, discarded penetration lines, anchor lines, and other nets and ropes of all sizes in and around shipwrecks. Each of these could be potentially hazardous if entanglement occurs. A good sharp knife will assure us an easy escape. The back-up knife serves the same function if the main knife is lost or cannot be easily reached.

To sharpen your knife simply use a metal file, which can be found in any hardware store. File both sides and leave the ragged razor-like burr on the edge. It is not necessary to get the edge perfect or stone sharpen the edge. The down side to sharpening in this manner is the knife dulls rapidly, thus sharpening will be necessary fairly often. I recommend sharpening each day of diving.

TETHER LINE

A tether line reel can be used not only for penetration, but as an emergency up line, or in the case of limited visibility it can serve as a guide to and from the boats' anchor. You should always have an adequate supply of line for the depth of water you're diving in. For example, because of the presence of any current when and if the reel is used as an up line, if you're diving in 100 feet of water your reel should contain no less than 200 feet of line. This is just one of the many variations and uses of reels.

TOOLS

While tools are certainly not mandatory equipment, many wreck divers bring them to aid in the removal of artifacts. It's not uncommon for a Jersey wreck diver to have a sledge hammer, chisel, and crow bar as part of his standard dive equipment. I only mention these tools to discuss the way they should be mounted. First, the weight of each tool must be reduced

from the amount of weight on your weight belt. The placement of each tool, or in fact any piece of equipment, is critical. Everything must be streamlined and in an easily accessible location. For example, what good is a back up light if you can't locate and turn it on easily and quickly? The same thing goes for tools. Why bring a crow bar if you can't use it or if it hangs down constantly snagging into each piece of wreckage you swim by? Remember, wreck diving is fun and exciting and just because someone else dives with a hardware store full of equipment doesn't mean you have to.

NAVIGATION

Most wreck dives are done from a boat anchored above the particular site. Depending on visibility and currents, it may be difficult to find the anchor line at the end of the dive. The end result of not returning to the anchor line could be a long swim back to the boat or, if the diver has exceeded the no decompression limits, a free floating hang. Here are a few hints for navigation around a wreck. First, you should begin any boat dive by swimming into the current which will make for an easier swim when returning. If the wreck is intact and the visibility is good, it is often no problem to simply note where you are and return later.

However, if visibility is limited, or if the wreck is scattered over a large area with no distant reference points, divers can use a tether line reel by clipping one end on or near the anchor and letting line out as they swim to explore the wreckage. This is almost fool proof because as long as the line is not severed you can easily return to your starting point. Although this is very safe and dependable, this method does have its disadvantages. One is the way it limits a divers investigation to the length of the line, and the same territory must be covered during the second half of the dive.

When using this navigational tool, be careful not to let too much line out as you swim. During a visit to the wreck of a German submarine, U-8532, last year I watched in amazement as two so-called good wreck divers let yards and yards of extra nylon line escape from their reel. Their line drifted into other divers and tangled up an entire area of the wreck. In fact, it was so bad that the divers could not even use the line to find their way back. Aside from not getting the benefit of a navigational aid from their tool, these divers ended up cutting the line and leaving it behind on the site. The divers'

nylon line would have stayed there for years causing a nuisance to all if it hadn't been cut and removed by two other divers. If the anchor happens to come loose from the wreck, you can use your line as an up line by attaching a lift bag to the end and sending it to the surface. The line is then tied to the wreck and cut. This method also provides a surface marker and acts as your own personal anchor line.

Another commonly used method is the perimeter search in which a diver descends on the anchor line and swims directly to either side of the wreck. The next step is to take note of an object, then swim up-current while exploring, spearfishing, taking photos or whatever. When you want to return, simply swim down current along the wreck's side until you see your designated road sign. Lastly, swim towards the center of the wreckage where you should find the anchor.

Eventually navigation becomes second nature. The more you dive the better your navigational skills become. And, the more dives you do on each wreck puts more of a picture in your head and soon you will recognize parts of the ship. After many excursions to the same wreck you will be able to navigate simply from your knowledge of the area.

POTENTIAL HAZARDS

While wreck diving does have some hazards, most are easily avoidable. All divers should know how to react if and when they do encounter one of these situations.

Monofilament lines used by anglers fishing over wreck sites cover many wrecks. Fishermen constantly return to wrecks because of the amount of aquatic life they attract. Unfortunately for them, and us, the wreck also snags many of their rigs leaving the long strands of nearly invisible mono draped across the site. Although many Caribbean shipwrecks do not have this problem, when diving on the East coast, in California, or in many inland waterways, divers have to be aware of this hazard. When a diver does get snagged he has two options, depending on what part of his body or equipment is tangled. Usually, when dealing in lightweight mono a small tug will snap the line, otherwise simply take out one of the two knives (always kept sharp) and cut the line. Either way this type of snag should cause no stress at all since divers should break or cut the mono

almost as routinely as one ties his shoe laces. By the way, even better than becoming good at cutting mono is the development of a good eye for the thin strands of clear line and avoiding them completely.

Fish nets are less common and usually much easier to avoid. However, in dark or murky waters these nets can be very hazardous. This is just one more reason to carry not only one, but two sharp knives. Although I've never been tangled in a fish net, the rule is the same: Stop, Think and then Act. Stopping all motion will prevent further entanglement and if the snag is small, you may try to simply undo it. If you can't, cut yourself free with your knife. Could you imagine how entangled you would become if this was tried with a dull knife?

Entrapment in a wreck is also a hazard. This can happen when a diver tries to wiggle through a hole that is not large enough for his body, or if he somehow gets lost inside the wreckage. In my opinion, this is the worst of the hazards listed so far and requires absolute control of one's physical and mental being. Again, Stop, Think, then Act. Struggling usually only results in quicker air consumption. If you get stuck, calmly try to free yourself, or signal your buddy to assist you. If you're lost, (which should not occur if you are trained properly, use a tether line and do progressive penetration) try turning off all lights and then look for any ambient light which may lead to an opening large enough to fit through. If your predicament is caused by kicked up sediment and you're at the beginning or middle of your dive, try staying motionless for about one minute. The silt may settle enough for you to see your way out. Be forewarned, one minute seems like an eternity when you're in this type of situation. The key is to remain calm.

In 1985, while diving on the wreck of the German submarine, U-8532, my dive partner, Billy Campbell, and I penetrated through a hole just forward of the conning tower. We started to swim forward, room by room, carefully finger walking so as not to kick up any silt. While moving through a hatch between the second and third room, I found myself stuck. I tried moving forward but was restrained. When I tried to back out, I was still caught. This was a little strange because the hatch was plenty big for one diver wearing doubles and a pony bottle, nevertheless, I was stuck. I was in 130 feet of

water and three rooms deep into a submarine. I took a quick glance down and in front of me were two shoes and two leg bones, one of the sad casualties of WWII. At that point, I thought I was about to panic. Then, I caught hold of myself and thought out the situation. First, I checked my air supply, it was fine. Next, I started to feel for what had me snagged. Bill, who was behind me, saw I was caught but couldn't get close enough to help. I could feel that the snag was on my left side and high, by my tanks. With one hand I felt around and found that one of my gauge hoses had caught onto a small pipe. By trying to move forward or backward it would not come free, but by simply leaning to my right it came loose. This whole scenario had occurred and was resolved in less than one minute. It had caused no panic and my air consumption was still normal. Bill and I turned around and explored more of the wreck as we exited. If however, this or any number of other situations occurred and the diver in trouble panicked, that diver would be in real trouble. Calm, collective thought is the key to dealing with any hazardous situation.

It is impossible to cover all aspects of wreck diving in one article. There are many variations of techniques and equipment. To research the wreck's history, preserve recovered artifacts, and safely penetrate a wreck are topics that can be learned from advanced education. There are many lessons to learn while experiencing the thrill of wreck diving.

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Steve Bielenka is a PADI Master Instructor with over twenty years of wreck diving experience. Steve is a licensed Ocean Operator, owner operator of the Research Vessel Wahoo and has lead 21 Andrea Doria expeditions. Steve recently participated as second in command of a filming expedition to the USS Monitor. Steve is a noted marine historian of Northeast shipwrecks and is the president of the Eastern Dive Boat Association. He is also a board member of CURE (Center for Underwater Research and Exploration).

The Art and Ethics of SPEARFISHING

Part 1

An Introduction to Spearfishing and The Equipment Needed

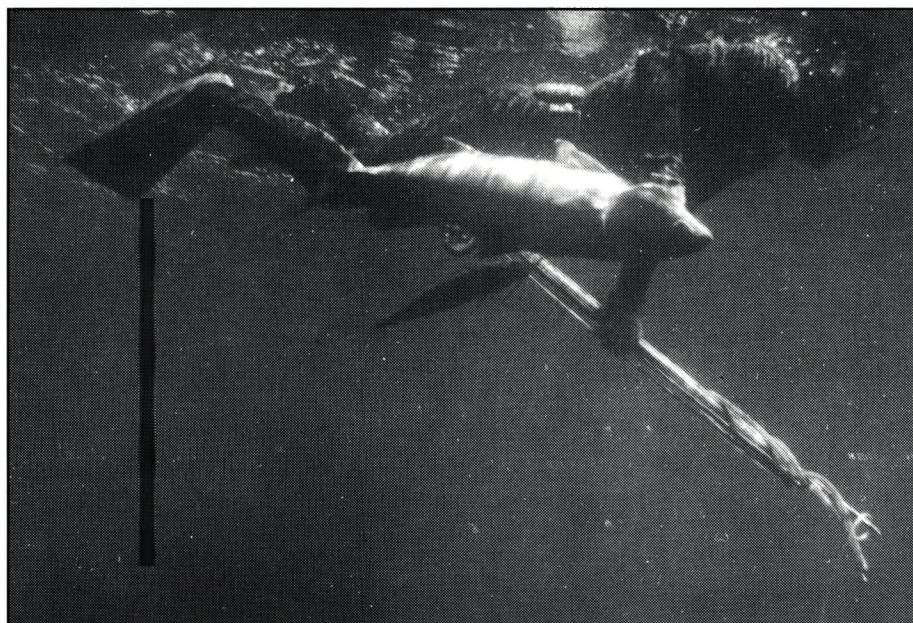
"The hunter of deer must understand the forest. He must know it far better than the berry picker, or the root digger. He must know where the open spaces are by the sound of the wind through the tops of the trees. He must know what the deer has eaten, and where its food might be found. He must become invisible and move without sound. He must become the deer." — Blackfoot Indian

By Carlos Eyles

So it is with spearfishing, except our wilderness is under the ocean and instead of the deer we must become the fish.

Spearfishing offers a unique opportunity, perhaps the last for modern man, to interact on a very special level with the natural world. The free diving spearfisherman must learn to move within the ocean environment as one of its inhabitants. He must learn to see differently than he sees in the world of automobiles and tall buildings. But before all of this, he must understand that spearfishing is not like bowling, or skiing, or any other activity or sport. Spearfishing is not fishing. It is hunting; it is stalking and killing a living creature.

Some would-be spearfisherman look at the mechanics of spearfishing - the stalking, the aiming of the gun, the pulling of the trigger, the landing of the fish - and it is all



they see. A fish is speared and then cast adrift if it doesn't suit them. Some bring their speared fish to the beach, flaunt them, then leave the fish to rot in the sun. They are killers, not hunters. They have little regard for the life and beauty of a living creature and its gift of nourishment. They do not see the delicate balance that keeps the natural world in harmony, they do not understand the laws of nature. The true hunter hunts only to eat, but there are few true hunters anymore. So the best we can do is kill only what we will eat. That is the first law of the hunter. The second law is to never take more than we need. Understanding and respecting these laws alters your ocean experience, heightening your awareness of the environment. Even the meals placed on your table from your efforts will seem more nourishing than those acquired in a less conscious and personal manner.

Techniques and Equipment

Different regions of the oceans require different hunting techniques and equipment. The information that is passed on here is general in nature; the specifics must be sought out in the particular area of the world you are diving. Usually there is a spearfisherman or two in every dive shop and they love to talk about what they love to do. They can tell you the better areas to dive, the species of game that is abundant and the preferred hunting tools for that particular game.

It has been my experience that free diving is the most effective method for hunting fish. It may not be the best method in your area and scuba might be the practical tool to use, so fill in the gaps where they apply. The free diver can cover more area of water than the scuba diver and is not limited by his air tank's capacity. Perhaps

DIVING TRENDS

most importantly, he does not have to contend with the noise and bulkiness of a scuba unit.

I believe the less equipment the hunter carries into the water with him, the fewer distractions he or she will have. Basically all you need is a mask, a snorkel, a pair of fins, a small knife, a fish stringer, a pair of gloves, a hunting tool, (a fishing license - ed.) and an inflatable vest which is optional. If you are diving in chilly waters, you will need a wet suit and all that goes with it.

A low volume mask with a protruding nose that can be easily pinched to equalize the internal ear pressure with the external water pressure is essential. The free diver continually moves up and down the pressure ladder and will equalize much more often than the scuba diver. A low volume mask doesn't require as much air from the lungs to blow into the mask to prevent squeeze when the diver is making dives beyond 30 feet. One last note on face

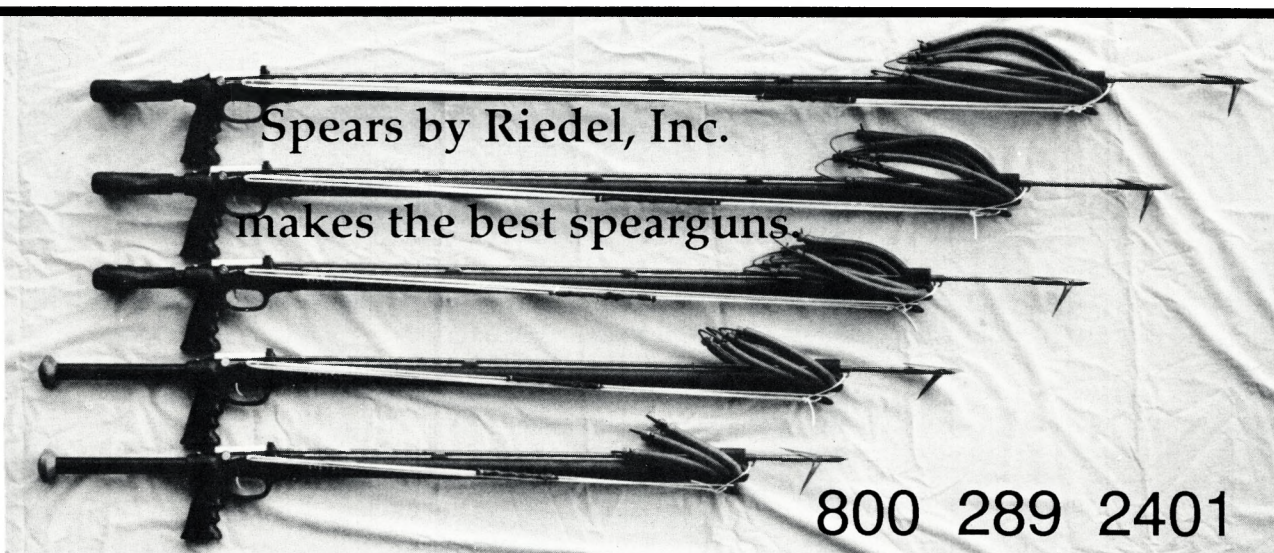
masks. There is absolutely nothing more distracting than a leaky mask. If your mask leaks, get one that doesn't.

Snorkels should have enough volume so inhaling and exhaling is not an effort. However, if the bore is too large, the snorkel may not easily clear after each dive. If you find yourself lifting your head out of the water to dump out the snorkel, its purpose has been defeated. Bear in mind that as a free diver you will be spending more time in the water and the mouthpiece of the snorkel may begin to rub on your gums creating sore spots. If it rubs, trim the flange of the mouthpiece down to a comfortable fit to eliminate the problem.

Because you will be spending longer periods of time in the water, comfort should be the first consideration when selecting a pair of fins. A slight discomfort can develop into a distracting pain after several hours of constant movement. I wear a pair of heavy socks under my booties for addi-

tional protection and insulation. The socks also prevent excess air from becoming trapped inside the bootie that later releases as telltale bubbles on the descent. A seemingly insignificant point, but one that becomes important when it is understood how such bubbles can alert the fish population that a diver is in the area. If your free diving experience has been limited, stay with the fins you are now using. As you progress and begin to dive deeper, you may want to graduate to a stiffer-bladed fin for greater lift off the bottom. Extra stress is placed on the legs with these fins so make sure your legs are ready for them.

Whenever a speargun is used there is always the possibility the shooting line will get hung up. A sharp knife should be carried any time you use a gun. The knife should be easily accessible and not another object that can get tangled in line, kelp or other debris. I tuck a small knife in the zipper space along the ankle of my wet suit



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and secure it with two heavy duty rubber bands.

There are many gloves of different fabrics on the market suitable for different underwater jobs in different underwater climates. I recommend a pair of cotton gloves for spearfishing because the hunter can feel the trigger with some sensitivity as well as get a better grip on a struggling fish. If you do a lot of hunting, anticipate going through several sets of gloves in a season.

A fish stringer is a necessary piece of equipment to carry your fish after they have been speared. There are two commonly used types of fish stringers: one looks like an oversized safety pin, the other is a stainless steel rod about eight inches long with a line running through a hole punched in the center of the rod. The fish is secured to the diver by running the rod or pin through the eyes or up the gill and out of the mouth. I prefer this stringer because it is less bulky than the safety pin and I can pull the stringer close to my weight belt by bolting a clip to a weight and running the rod through the clip, keeping the fish tight against my body and out of the way. Obviously, if you are diving in waters populated by sharks, this method would not be the ideal way to carry fish. Better to return them to the boat or shore, or run a long line from the butt of your speargun with a buoy attached and string the fish to the buoy.

Hunting Tools

There are basically three types of hunting tools: the pole spear, the Hawaiian sling, and the speargun. The pole spear is an ideal hunting tool for the beginning spearfisherman. They are often made of aluminum or fiberglass, and on one end rubber tubing is attached and on the other, a spear point, usually a multi-tined head is secured. To cock the spear one merely draws the tubing up toward the spear point until it is taut then lets go of the pole, guiding it loosely with the hand. The pole spear is quick to recock and easy to fire. Because its range is limited, it forces the hunter to move in closely for a shot, thus developing good stalking skills.

The Hawaiian sling uses a free shaft restricting its use to clear water. Otherwise a speared fish, if not mortally wounded could swim off and disappear with the shaft, and missed shots might be lost in the

gloom of poor visibility. A simple instrument, the sling is nothing more than a nine to twelve-inch, hollow tube with a length of runner tubing attached to one end. The spear shaft is inserted down the tube and into the rubber tubing. The shaft is drawn back much the same as a bow and arrow, then released. The Hawaiian sling is relatively easy to make, quick to reload, and depending upon the strength of the shooter has reasonable power and range. The principle drawback of the sling is the difficulty in its mastery. (I would be remiss if I did not point out that one of the finest spearfishermen ever to come out of this country, Art Pinder from Florida, uses the Hawaiian sling).

The speargun is far and away the most popular of the hunting tools. There are several types: rubber powered, pneumatic, and spring-loaded. The rubber powered speargun has, over the last 30 years, proven its reliability. They are the easiest to maintain and have a simplicity of design that insures few breakdowns. Other types of spearguns have more moving parts and there is a greater chance of a malfunction with the closer tolerances required. Nothing is more frustrating than to drop down on a nice fish you have taken the utmost care in stalking, and then have the gun misfire.

Several factors need to be considered when purchasing a speargun. First, of course, is the fish you will be stalking and secondly, the clarity of the water. If the water is clear 25 feet or better, and the fish are large or have thick scales, then power and range is the first consideration. If the water is generally murky, your range is limited to the visibility and your shots will be quicker and a smaller gun would be the practical tool.

Your speargun should have a safety that releases silently and smoothly with one finger from your gun hand. If the release produces noise, it may spook the fish. A high quality speargun is a good investment. Make sure it has a stainless steel shaft and trigger mechanism because any other metal will pit and corrode in a short time. Also, avoid trigger mechanisms with plastic innerparts that are tied in to the release. Over time the pressure of a loaded gun will wear the plastic and alter the tolerances so eventually the gun will begin to misfire.

There are a multitude of spearheads to

choose from, more than could be explored here. In order of holding capability, they are the five-tined gig, the one-barb straight head, the two-barb spinner and the detachable head. The selection of a spearhead should be compatible with the size of the speargun and the fish being stalked.

Before making your purchase talk to the spearfisherman at your dive shop and ask about the type of fish in your area and where the fish might be found. Then get an idea of the best tool to use based on that information and your own experience in the water. You might just want to make a few dives in the recommended areas and check out the visibility and fish for yourself. Imagine yourself using several different types of spearguns or spear poles on the fish you are observing. From that exercise you should have a clear idea of the hunting tool that would best fill your particular needs.

In the next article, breath holding and stalking will be discussed.

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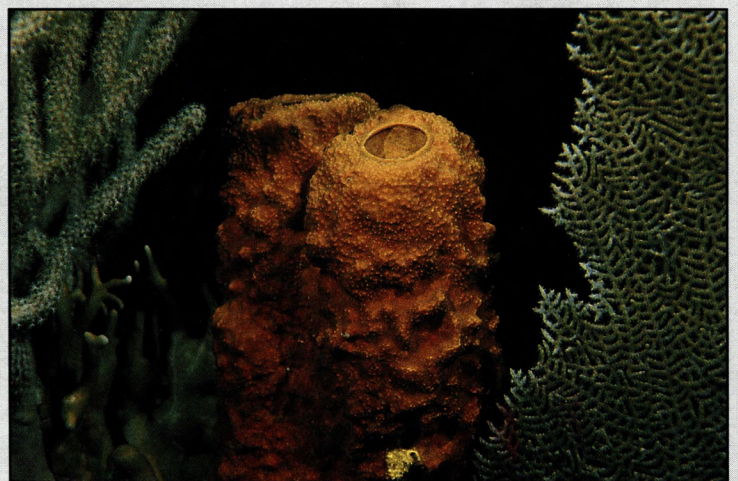
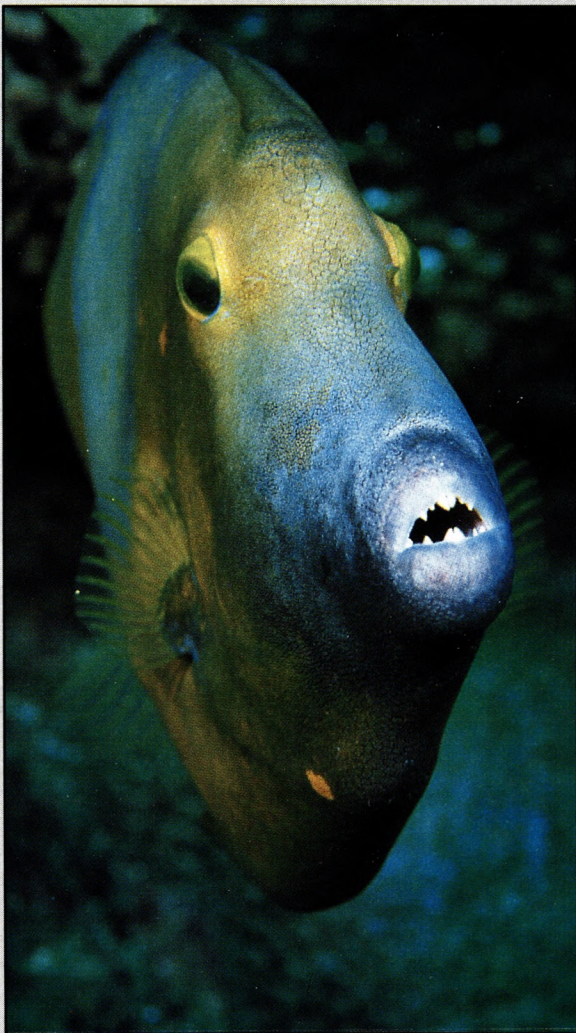
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By Ken Loyst Buddy Jolene Brunton
 Photography by Ken Loyst Date 9/06/90 Dive No. 5343
 Location Yellow Butterflyfish Pass, Bay Islands, Roatan
 Visibility 120 feet Depth 15 to 120 feet Conditions Calm, no surge

The third dive of the day, it was to be my last dive off of Ocean Spirit. The ship had sold and this was its last cruise. The conditions were perfect for the previous two dives of the day and remained so for this experience. Because a tropical depression had passed the night before, the prevailing winds allowed us to dive the windward side of the Bay Islands. The ocean was mirror flat. Visibility was in excess of 120 feet off the wall.

The water was comfortably warm and the view over the wall beckoned us as we descended. The free-fall here took longer than any would have within the thin atmosphere far above. We leveled off at 90 feet and were immediately greeted by a hawksbill turtle. Curious of the intruders, the hawksbill swam within inches of our masks. I adjusted my strobes, checked ambient light, and began firing my housed F-4. The blinding light startled the turtle into a dive. It effortlessly glided down the wall. I slowly followed, bracketing photos, until I was satisfied I had the images I wanted.

We ascended back up the wall and began observing the abundant life at this reef. Oblivious to anything else around, a school of creole wrasse (bottom right) poised head-down at a cleaning station, each waiting for its turn to be cleaned. A whitespotted filefish (bottom left) approached the camera and showed off its coral-crushing teeth. I photographed several sponges (middle right), contrasting vivid colors whenever possible. Then, a juvenile redband parrotfish (top), extending its dorsal spines in self-protection, suspiciously watched as I snapped off the last few frames available in the roll. It was a perfect dive to end a wonderful cruise.



Sipadan



Above: Flashlight fish with bioluminescent pouches under their eyes glowing like tiny headlights are found in the many caves.

Left: The walls of Sipadan plummet to over 2000 feet!

Below: At the Sepilok Orang-utan Sanctuary, if an animal comes up to you, you are allowed to interact with it. Here, Mia Tegner cuddles a female.

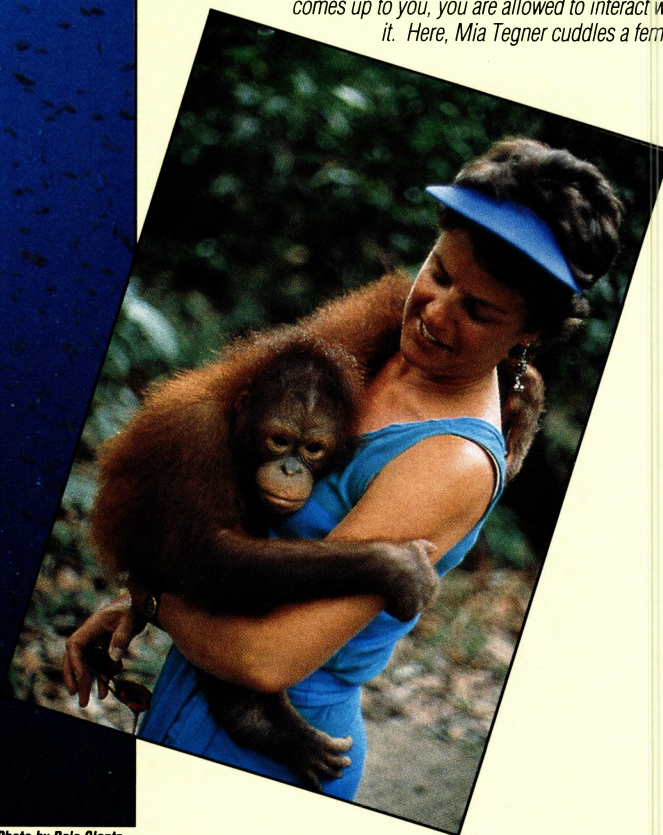


Photo by Dale Glantz

Text and photography by Eric Hanauer

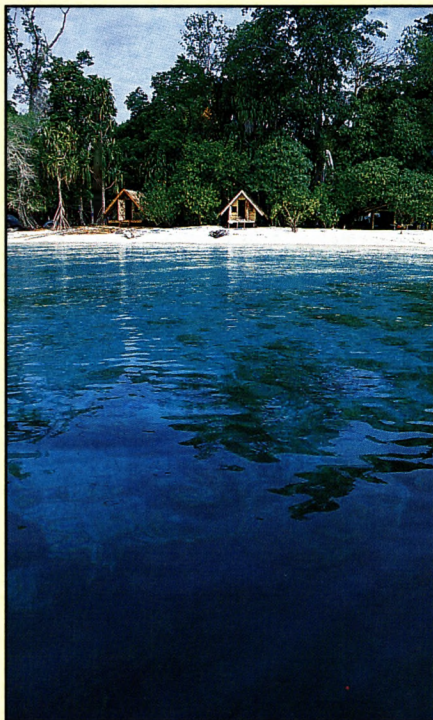


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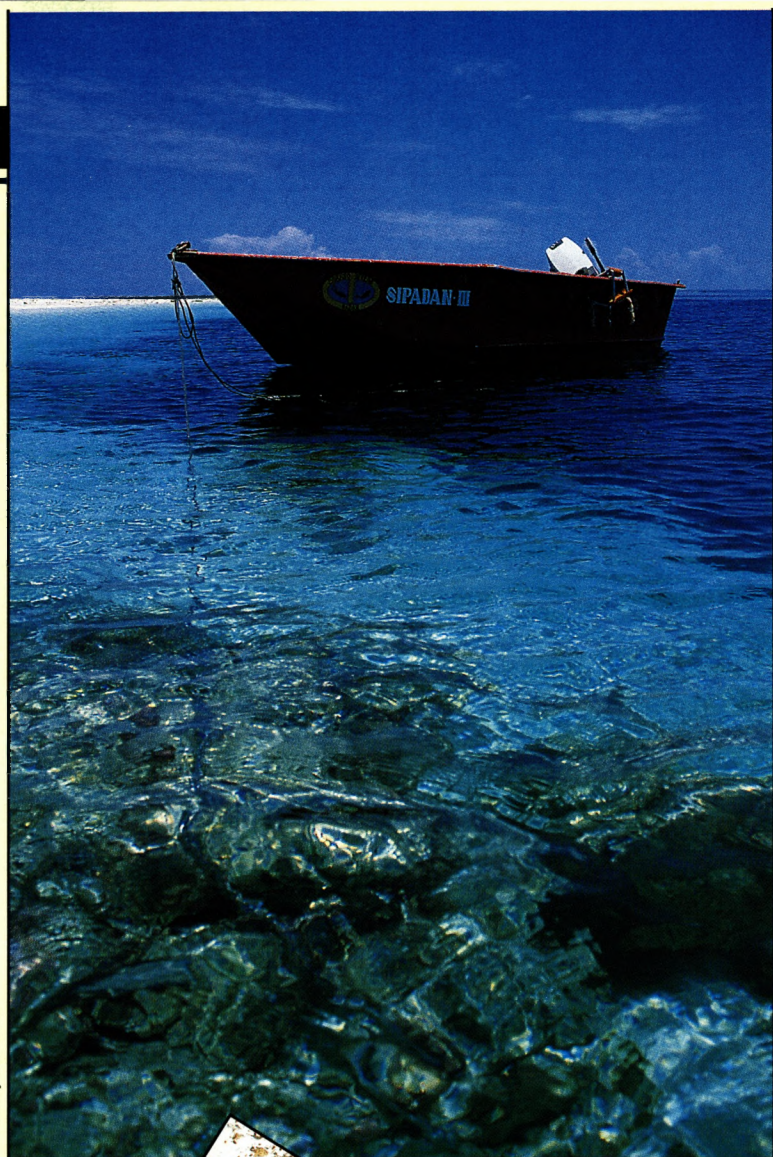


Photo by Dale Giantz

W

e all have dreams of a tropical paradise. It's usually a small jungle island, surrounded by white sand beach and a fringing reef. We would live in bamboo huts with thatched palm roofs and fall asleep to the sounds of surf, monkeys, and tropical birds. At any time, we could put on our gear and go diving on a sensational dropoff that begins just a few steps from our front porch. Or else we would get on a small boat and ride, no more than ten minutes, to other wonderful dive sites.

That dream has come true for Ron Holland, an ex-commercial diver from Manchester, England. He built it on Sipadan Island, off the coast of Borneo in Malaysia. I have made two trips there over the past couple of years, and if the opportunity came to do it again, I wouldn't hesitate.

Even with just average diving, this would have been a fantasy come true. As we tuned in to the sea and to the jungle around us, the pace of life slowed to an easy flow. There was no schedule, we could dive any time we wanted to, and the underwater scenery was spectacular.

Located just south of the Philippines, Sipadan is near the virtual center of the Indo-Pacific, where the diversity of marine life is the richest on the globe. It is Malaysia's only oceanic island, lying beyond the continental shelf and dropping off directly into 2,000 feet of water. You can walk around the entire island in 25 minutes, but it would take an hour to tramp through the dense jungle in its center. Pockmarked by craters, the sand near the water's edge looks like an abandoned battleground. The holes have been dug by nesting sea

Left: The huts are relatively new to Sipadan. Until recently, guests were accommodated in tents.

Right: With the drop-off so close to beach, shore diving takes on a new meaning.

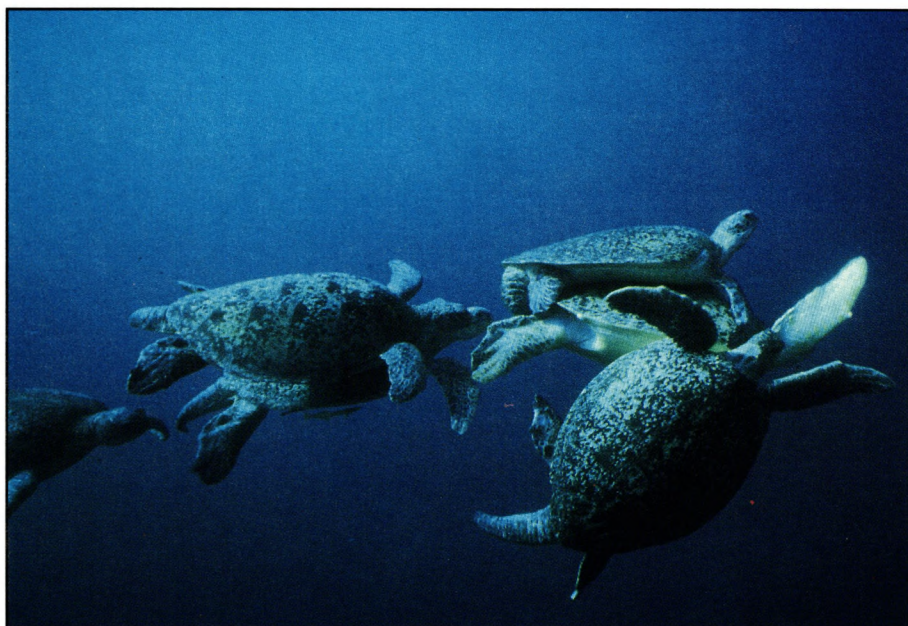


Mia observes turtle skeletons inside the submerged cave beneath Sipadan. Nineteen skeletons are inside.



Right: Two green turtles mate, as a couple of amorous males attempt to join in.

Left: Menage au trois turtle-style! Mating turtles are common sights in the waters off Sipadan.



turtles, who haul ashore here to lay their eggs. Although the major nesting season is late summer and early fall, on any night of the year several green turtles come ashore to carry out their ageless ritual.

Turtles are what make Sipadan's diving truly unique. Their entire life cycle is on display here, from conception to death. On every dive, you are bound to encounter turtles. Even outside of the regular season, mating pairs may be observed. And on the wall in front of the island is the entrance to an underwater cave that has become a grave-

yard for the marine reptiles.

You may have seen Sipadan on a recent Jacques Cousteau television program. When *Calypso* arrived unannounced, the crew was so taken by the island that they stayed six weeks, filming its unique marine life. Even the Captain flew out from Paris to see it for himself, and to direct operations. Never before had they spent so much time in so small an area.

But if your idea of a diving vacation demands exciting night life and air-conditioned comfort, don't come to Sipadan. It's

hot and sultry sleeping under mosquito netting; the only night life is underwater. Meals, prepared by Ron's friendly Philippine crew, are good and filling, but hardly of gourmet quality. Holland is determined to keep the island experience as close to nature as possible, while providing creature comforts that will satisfy most touring divers. There are ten small huts, accommodating up to 24 guests total. There are fresh-water showers and even flush toilets. A generator supplies light and electricity for about twelve hours a day, both 110 and 220 volts. Because the huts are just big enough for two to four beds, the lodge — carpeted in white sand — is the social center of the island. Here the guests meet to read, listen to music, or trade stories about the dives just completed and those to come.

Dive Sites

No dive site is more than a ten-minute boat ride from the base camp. Directly off the beach in front of the huts is the sheerest wall on the island, dropping straight down into 2,000 feet of water. Life on **The Dropoff** reflects the diversity of this region, with multi-colored soft corals, clown triggerfish, several species of Anthias, sponges, and crinoids. Black coral trees begin at 30 feet, a sure sign that Sipadan's resources haven't been exploited yet. Because of the easy entry from the beach, this is also the favored night diving spot. It's about a fifteen yard



A marketplace scene in Borneo.

walk across a shallow sand bottom, then a big step into blue water.

At twenty feet is an opening to the hidden cave that Holland has named **Turtle Tomb**. The entrance to its main chamber is a high arch, but that's not the way to begin this dive. Instead we squeeze through a narrow crevice in another part of the wall that looks like a dead end. Crawling through a couple of tight passages, we have to turn sideways as our tanks scrape the rocks. But suddenly the passage opens into a very large, dark chamber. We follow the guidelines that Ron has set across the ceiling, with only the light of our torches piercing the blackness. Suddenly we come upon a huge rock formation resembling a rhinoceros head. Directly behind the "horn" lies an intact turtle skeleton, the skull arched upward, as if the animal were still searching for the way out through its empty eye sockets. In the silt below the rock lie two more skeletons. Continuing to follow the lines, we are led to more and more remains – 19 skeletons in all.

"The Place Where Turtles Come to Die" has the makings of a romantic legend, but Holland debunks the myth. His pragmatic explanation is that the turtles entered the cave seeking food or rest, then couldn't find their way out, and drowned. The same fate could befall us, except for the guidelines on the ceiling.

Ron once found a freshly dead turtle lying on the bottom. When he returned a couple of days later, it was gone. He eventually found the body pinned against the ceiling, floating there owing to the gases of decomposition. A week or so later, the rotting corpse was upside down on the bottom. Holland doesn't allow anyone to disturb the bones, although I suspect he may have positioned the skull on the rhinoceros rock for a more dramatic picture.

Continuing through a narrow passageway, we turn off our lights to observe a school of flashlight fish, the bioluminescent pouches under their eyes glowing like tiny headlights. Abruptly, the cave opens up into a large main chamber. Here the bottom drops to sixty feet, and an ethereal blue light filters in through the high, arching main entrance. One more spectacular sight remains. As we approach the arch, a vast school of large jacks swirls outside. Extremely wary, they would disappear immediately into deeper water if they were cogni-

zant of our bubbles. But since we are hidden inside the cave, we can watch them until it's time to exit to the surface.

Because the inner chamber ranges from 20 to 35 feet deep, this is a long, safe dive, with lots of bottom time, as long as the diver has no problems with the dark or with claus-

trophobia. Holland will not bring guests into the inner chamber until he is sure of their ability.

Although the caves present the most unique diving on Sipadan, there are other dive sites worth several trips. **Barracuda Point** is a drift dive, the place most consis-

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tently washed by currents. A large school of barracuda, numbering in the hundreds, is a steady resident. They hang out between 30 and 80 feet, heading for deeper water when divers act too aggressive. However, if you approach slowly, you may be able to join the school and drift in the current, completely surrounded by barracudas. This is also the best place on the island to observe sharks, with whitetips the most prevalent species. We were able to approach the small ones within ten feet; the larger ones were more cautious.

Hanging Gardens, another drift dive, is the best place on the island for soft corals. These are mostly small, in various pastel shades, and hang rather limply. However, they virtually cover the entire wall; there are no bare areas. Friendly batfish often pursued us on our drifts. Ron doesn't allow fish feeding or turtle riding; he wants animal behaviors to remain as natural as possible. Therefore, I like to think the batfish followed

us for friendship rather than baksheesh.

Turtles often rest on the shallow reef top; they are commonly observed swimming in open water as well. A school of huge bumphead parrotfish, each close to four feet long, also frequents this area. They constantly chew the corals and excrete sand. Unfortunately, the excretions cloud the water around them, as if they were bringing along their own smokescreen. This makes photographing the school nearly impossible.

Be sure to spend some time on the ledge along the reef top, in five to ten feet of water. Table coral formations are stacked in layers, while thousands of small, colorful fish make you feel as though you were swimming in a tropical aquarium.

Mating Turtles

The climax of our first trip came on the final day of diving. We were sitting in the galley, when Ron noticed a pair of turtles on the surface, some 250 yards offshore. He

told me they were mating, and suggested I snorkel out there and shoot pictures.

"By the time I set up my camera and get out there they'll be long gone," I protested. Ron assured me that turtle mating sessions continue for hours, and that they usually stay close to the surface for heavy breathing when necessary.

Against my better judgement, I swam out there with free diving gear and a camera. But Ron was right. Too involved in their activity to move very far, the male was on top of the female, grasping her carapace with his front flippers. When I came close they dived, but remained united. I followed to a depth of about 30 feet, and eventually they seemed to sense that I meant no harm. During the next 20 minutes, I watched, fascinated as two more amorous males tried to join in. One of them actually climbed atop the first male in an impromptu underwater *menage au trois*.

The photos were good, but could have been better. I considered myself fortunate to film something few people had ever seen, but didn't ever expect to have another opportunity.

I was wrong. A year later, the same thing happened. When we spotted them, there were two other divers in the lodge. I asked for a two-minute head start, in case the sight of three charging divers would spook the animals. One gave me about 10 seconds, the other just kept sprinting ahead.

But as soon as they spotted five turtles below them, they stopped. I didn't. Following a trail of turtles, I finally found the mating pair. Once again a third turtle tried to climb aboard. A fourth, in an apparent fit of jealousy, bit the rear flipper of the intruder. I gasped as pieces of flesh spewed out.

At the time, I had no idea how many turtles were in the aggregation. It was just a jumble of bodies as the amorous males gave chase, then pulled one another off when it seemed a rival was about to join in. Later, viewing the slides revealed up to seven in one frame. I repeatedly dived, checked my light meter, then shot three to five frames before running out of breath and surfacing. Eventually the heavy breathing took its toll on the turtles as well, because they began to surface about every two minutes. Scarcely able to believe my good fortune, I quickly burned the roll of 36 exposures. Practically



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walking on water, I figured that about a dozen of these shots were better than my best of the previous year.

Things To Do On Land

Some people go on a vacation just to dive. In Malaysia, this would be a mistake, because there is lots to see and do once you leave the water.

Malaysia reinforces some of our stereotypes of southeast Asia, and contradicts others. Its ethnic mix includes Malay, Chinese, and Indian. With a rich supply of resources including hardwood, tin, oil, and rubber — combined with textile and electronics manufacturing — it is an upscale country. The skyline of the capital, Kuala Lumpur, is dominated by modern high-rises. There are also 19th century British colonial structures based on Moghul Indian architecture, as well as beautiful mosques and Hindu temples. Homesick Americans will find shopping malls, McDonald's, 7-Elevens, and even 31 Flavors. English is spoken nearly everywhere, the legacy of many decades of British rule. Transportation and tourist services are extremely efficient.

The country is divided among two land masses: peninsular Malaysia and Borneo, the world's third largest island. When one thinks of Borneo, the first word that comes to mind is "jungle." Split up between Indonesia, Brunei, and Malaysia, Borneo is home to one of the world's richest rain forests. Through much of the jungle, rivers serve as superhighways, and long, narrow riverboats have been developed to move people and goods. Looking like an airplane inside, these boats even offer videos to occupy the exotic mix of passengers during long trips. Unfortunately, the programs consist entirely of Ninja movies and American wrestling.

Up the river, we transferred into a longboat to continue our journey, which climaxed in a jungle trek to Mulu Caves. One of the largest underground cavern systems in the world, Clearwater Cave extends 51 1/2 kilometers. Inside Deer Cave after a rain, a waterfall pours from the ceiling, 190 meters high.

On our first trip, we also visited Mount Kinabalu, the highest peak in southeast Asia. Its cloud-covered, multiple peaks are said to be the hiding places of the spirits. Unfortunately, we hadn't made arrangements to

climb the mountain, so that was one of my goals for this year. The climb begins at park headquarters, an elevation of 6,000 feet, and every climber must be accompanied by a registered guide. Malaysia's approach to this mountain is the opposite of what one would expect in the Orient: quite direct. There are few switchbacks; for the most part the path goes straight up to the summit at 13,500 feet. Steps are cut into the steep trail, with logs placed at their bases to control erosion.

On the first day, we climbed five hours, to the Panar Laban Resthouse at 11,000 feet. This two-story structure sleeps about 50 people in bunk beds, and even includes a small restaurant, showers, and electric radiators in the rooms. It took three years to build, because every board and appliance had to be carried up there by porters.

The next day we were awakened at 2:00 a.m., and on the trail an hour later. The reason given for the early start is that the summit is usually shrouded in clouds by late morning. As I struggled up the steep cliff faces on log ladders and ropes, I figured another reason was to hide the difficulty of the final climb.

But the view from the summit was worth the struggle. Although the temperature was near freezing and the wind chill factor near zero, it seemed as though we could see forever. The descent, including a short stop at the resthouse, took about 5 hours, a total of 13 climbing hours for the round trip.

Every year, a round-trip race is held on the mountain: the Climbathon. The current record is 2 hours and 18 minutes.

Another highlight of our land travels was the orang-utan sanctuary at Sepilok. Here young orang-utans, orphaned through logging operations, are rehabilitated to life in the wild. Until they are old enough to fend for themselves, they are hand-fed. Later, they are set loose in a park environment, where they come twice a day to feeding stations. As they become more self sufficient, the animals wander to more remote stations, and eventually live in their own jungle sanctuary. The entire rehabilitation process can take up to five years.

Visitors are warned not to initiate contact with the animals. But if one comes up to you, you are allowed to play with it. Like children everywhere, young orang-utans are

curious and fun-loving. We had just entered the park when a female sauntered up to us, grabbed my hand, and tried to join our group. She not only allowed us to pick her up, but acted sad when we put her down. When we began to leave, she grabbed a woman's leg with both arms and wouldn't let go.

Topside or underwater, Malaysia offers adventures and experiences well beyond the realm of everyday travel. There is luxury, shopping, and sightseeing to satisfy the sedentary traveler, as well as rugged adventure to challenge the most active. For further information, contact the Malaysia Tourist Information Center, 818 West 7th Street, Los Angeles, CA 90017. Telephone (213) 689-9702.

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Dive the Northeast

Text and photography by Lorraine Marzilli



A New Year. January 1st, and some of my buddies are taking a chilly dip, the first dive of the new year in Pleasure Bay, Boston, MA.

Please allow me to dispel the myth that there is no good diving in the Northeast, and welcome you to the new Northeast section of *Discover Diving*.

When people learn that I am a scuba diver, the first question they ask is "Where do you dive?". I can tell by the dreamy gleam in their eyes that the expected answer is some exotic location with creamy white sand, palm trees, warm sunshine and 95 degree temperatures, like Fiji or Bimini.

My answer is usually a surprising string of locations within a two hour drive of my home.

I begin to smile as I watch the dreamy gleam turn into a look of shocked disbelief as the names of sites like "Norman's Woe, Devil's Back, Hypocrite's Channel, Hathaway Pond, King's Beach, Brant Rock" (each has a faint sound of a local recognizable spot) but it is the "and Boston Light" that sinks in. The next question is always, "You mean that you dive up here?"

*The mussel beds at **Great Brewster** are covered with the rare salmon-colored northern white crust (*Didemnum albedum*). It is in abundance in the outer Boston Harbor area.*

Explore... Boston Harbor

There has been a myriad of misinformation and some bad press about the waters of the Boston Harbor area. This has lead most people to believe that all the beaches and waters here in the Northeast are polluted... and this is not true!

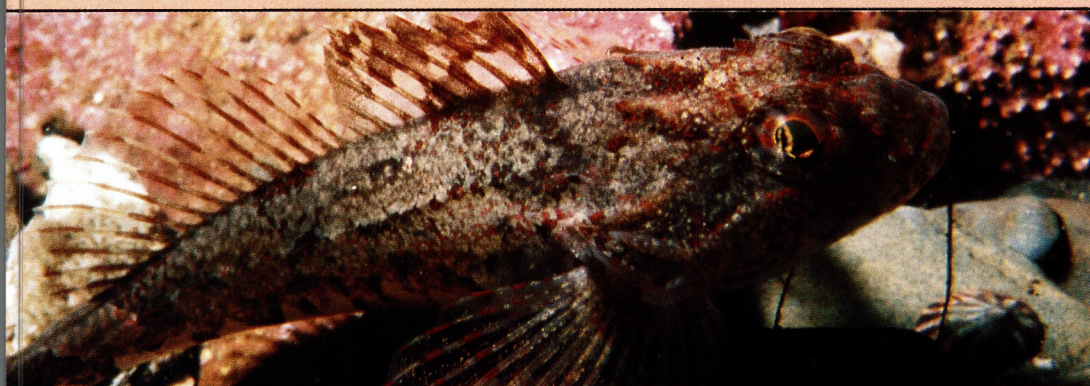
Living in Boston and loving the sport of scuba diving, I just can not wait for my semi-annual retreat to the tropics, not when there is so much beauty to see, wrecks to explore and fish to chase right here in the Northeast.

Through the Northeast column, you will join a host of divers in the exploration of dive sites, and the discovery of wrecks, as well as take a look at some environmental issues that are a concern to us above and below the water.

Take a short voyage in Boston's outer harbor. You are sure to enjoy some of the sites and you won't even get wet!



Above: Atlantic rock crabs (*Cancer irroatus*) are plentiful at **Minot's Light**. This pair stayed still for a quick intrusion of their privacy for a photograph.



Left: This miniature colorful fish is in abundance at **Minot's Light**. I've attempted to photograph a school of the three inch beauties, but they never seem to school as other fish do.

Future Reefs, Empty Reefs?

Defending Coral Reef Fish Stocks from Depletion

By Alexander Stone

A coral reef wouldn't be a coral reef without its fishes, without its marine life. Not really.

When we visit a reef, we explore it for its marine life. We peer below overhangs, probe crevices, glide over the reeftop in search of it.

The motionless school of bluestriped grunts floating weightless among the branches of an elkhorn coral... the sudden, bold frontal charge of a darkbrown dusky damselfish, smaller than a hand but ready to protect its territory from any intruder... the heartbanging surprise of a rushing school of silver-sided jacks flashing past the reef, hurrying off to some destination in the blue... all these and many more are vital parts of the wonder and value of coral reefs.

And we look for – even hunger for – ways to have a personal interaction with that marine life. At least, I know I do. I love making close eye-contact, almost cheek-to-cheek, with a gray angelfish, so trusting, curious and approachable. I love lying totally still on the sandbottom next to a large brain coral until the red-banded coral shrimp making a home on that coral head jump off and onto my arm, convinced I am there for its parasite-cleaning services. I love working my hand slowly under a rockhugging reef scorpionfish until it is resting on my palm, still believing that its terrific camouflage is keeping it hidden.

A reef without its marine life— without its natural abundance of marine life— would not be the same.

Destruction by Harvest

For literally thousands of years, men have harvested reef marine life for food, for recreation, for profit. And the reef always managed to replenish itself.

But we have reached the point where that isn't working anymore. Human populations have mushroomed, driving demand for seafood ever upwards. Fishing technology has evolved to meet that demand by waging total war on the denizens of the sea. If fishing practices continue as they are, the reefs may be emptied of many of its key inhabitants.

At least American coral reefs are spared the worst practices inflicted on the reefs of some other countries. Bleach fishing for lobster kills off corals with the toxic chemical. Reef blasting with dynamite kills all fish with the concussion of the explosion. Cyanide collection of live tropicals poisons their surroundings. Muroami herding into nets of all fish on a reef site, by scaring them out of their crevices through wholesale pounding of the reef surface with boulders, pulverizes the corals.

But there are still plenty of problem practices affecting American coral reefs and habitats.

Wire-mesh fish trapping targets snappers and groupers, but also indiscriminately catches tropicals and juveniles of all species. Chiseling and collecting live rock for aquariums quite literally takes away the habitat of many creatures. Shrimp trawling in reef nursery areas and over hardbottoms bycatches nine pounds of juvenile reef fish for every pound of shrimp caught - and also uproots soft corals, sponges and other benthic organisms.

Ultimately, though, the basic problem is that most targeted reef species are being seriously overfished. Too many fish are being caught. Fish populations are being systematically depleted while regulatory agencies respond too slowly or not at all.

Unaddressed Overfishing

Scientists agree that a fish population cannot replenish itself with certainty if fishing reduces that population's spawning stock below 30% of its natural unfished abundance. Yet every single species of commercially harvested snapper and grouper is now well below that population level - in the U.S. Caribbean, in the South Atlantic, and in the Gulf of Mexico.

Some species, like the red snapper, whose spawning stock has been driven down below 1% of its natural abundance, are beyond the brink of collapse. And yet real action is not forthcoming.

Project ReefKeeper is committed to reversing this alarming trend and preserving the natural abundance and diversity of life on our coral reefs.

Fisheries Management Decision-Making

In the United States, private citizens and groups have the right to work for responsible fisheries management through federal regional fishery management councils and through state fishery commissions.

The federal councils act under authority of the Magnuson Fishery Conservation and Management Act (PL-265). Eight regional councils are each composed of voting members appointed by the state governors in the region. Concerned citizens can participate fully in their decision-making processes.

Project ReefKeeper is presently concentrating its fisheries conservation efforts on the Gulf of Mexico Fishery Management Council (Texas, Louisiana, Mississippi, Alabama and Florida), the South Atlantic Fishery Management Council (Florida, Georgia, South Carolina and North Carolina), and the Caribbean Fishery Management Council (Puerto Rico and the U.S. Virgin Islands).

Each Council makes its own independent decisions, but they all follow the same procedure to regulate fisheries in federal waters beyond state three-mile limits.

The Councils group marine life into active fisheries, each of which has its own Fishery Management Plan. Fishery Management Plans of concern to Project ReefKeeper and other coral reef conservationists include those for snapper-grouper (over twelve grouped species), spiny lobster, shrimp, corals, and tropical reef fishes.

Each Fishery Management Plan defines overfishing for that fishery, and establishes gear regulations and catch quotas that are supposed to keep that target stock from being overfished.

If there is no Fishery Management Plan adopted, there is no protection or management for that stock. The Caribbean Fishery Management Council has no Coral

Fishery Management Plan. No Council has a Fishery Management Plan for tropical reef fish. No Council has adopted restrictions on the harvest of live rock.

But even the adopted Fishery Management Plans are not working. Snapper-grouper stocks are overfished everywhere.

Councils can enact Fishery Management Plan Amendments as needed to correct plan deficiencies, address gear problems or resolve other major issues. Councils also adjust catch quotas for each fishery on an annual basis.

To do all this, each Council meets monthly, holds public hearings, and makes all its proposed measures available in advance for public comment.

Standing Up for Reef Fish

Here is how any individual can participate in the Council process.

1. Request in writing that the Council place you on its mailing list for public comment notices and meeting announcements. Now you're in the information pipeline so you know what's going on.

2. Request in writing a copy of the Council's Fishery Management Plan for the marine life group(s) that concern you, and a copy of the official Guidelines for Fishery Management Plans (50CFR602). Now you have the basic document regulating the fishery, with background information on the ecological characteristics of the stock (abundance, range, growth, reproduction, etc.), and the detailed ground rules a Council is bound to follow in its decisions (which they often don't, leaving themselves open for court reversal of their rulings).

3. You should now begin receiving notices. Every new action proposed by a Council must be written up with its rationale into a Draft Document for public comment.

4. You can request copies of those Documents.

5. You can voice your approval or displeasure at public hearings you now are aware of. If you can't attend hearings, you can submit your comments in writing to the Council office and copies will be sent to all Council members.

The key thing is that you can be heard, you can enter into the official record information that may move the Council towards better decisions and, most importantly, the Council will know it is being watched and will be held accountable for its actions - or lack of action.

Involvement by conservationists is crucial - and it is crucial right now when so many key decisions affecting coral reef marine life still hang in the balance.

Involvement must grow to offset constant and intense lobbying by commercial fishing interests which very, very often delays, deflects, overwhelms and even intimidates a Council into allowing overexploitation practices to continue. Other voices, reef-caring voices, must be heard by the Councils. They must feel another presence besides that of commercial harvesters trapped by their boat payments into disregarding the future replenishment of fishery stocks.

Then, and only then, can coral reef conservationists turn the tide and make sure that the breathtaking abundance and tremendous diversity of coral reef marine life endure.

For more information:

Caribbean Fishery Management Council
Banco de Ponce Building, Suite 1108
Hato Rey, PR 00918
(809) 766-5926 / FAX (809) 766-6239

Gulf of Mexico Fishery Management Council
5401 West Kennedy Boulevard, Suite 881
Tampa, FL 33609
(813) 228-2815 / FAX (813) 225-7015

South Atlantic Fishery Management Council
1 Southpark Circle, Suite 306
Charleston, SC 29407
(803) 571-4366 / FAX (803) 769-4520

Project ReefKeeper
16345 West Dixie Highway, Suite 1121
Miami, FL 33160
(305) 945-4045 / FAX (same number)



MEGAMOUTH

**Text and photography
by Bruce Elliott Rasner**

It was not possible! The rare and elusive megamouth shark had been captured and towed into Dana Point Harbor to the doorstep of twelve million people who were absorbed with freeway congestion and other mundane matters. I have dived some fairly remote areas of the world and I never expected to find such an exotic creature within five minutes of my home.

The shark was tethered to an older commercial fishing boat. The *Moonshiner* had snared the megamouth in a 1,200 foot gill net at approximately 40 feet - only miles off the Southern California coast. The setting was unworthy.

By 9:00 a.m. there were hundreds of onlookers and a small army of media who strained to see his large dorsal fin occasionally cut the surface of the water. Most everyone was 150 feet away and the water was too dark to see anything else.



On the boat I saw evidence of its reported size of fifteen feet. I instinctively knew that if we could only take a brief opportunity to study this creature the correct thing to do would be to return it uncompromised to its deep-water habitat. Some of us who were privileged to be on the *Moonshiner* were disturbed to hear speculation of transporting it to one of several aquariums located throughout the nation. My ability to see the creature was limited as he struggled to stay at the bottom of the shallow harbor depths.

I never anticipated the throngs of boats and curiosity seekers who would follow us in our slow, deliberate tow of this peaceful animal out to deeper waters where we intended to study, videotape and photograph this wonderful shark. The three of us from the boat who were to pursue such photography were soon engulfed by a crowd of boats, swimmers and divers that strained at

the chance to approach this gentle giant. A sea filled with bubbles and ungainly divers was more than enough to persuade me to wait it out for awhile. It was impossible to control the divers descending from the other boats or impart to them that they more respectfully approach this tolerant, but overwhelmed creature.

Half an hour later when calm was restored and there was an improved environment for both the megamouth and my photography, I decided to descend to the 15-20 foot depths where he was stabilized. I was torn between the excitement of seeing something so special and my sense that he was vulnerable and at risk. The day-long stay in the harbor, the tow and the approach by so many divers, seemed to greatly stress the shark. I feared for his survival as I first got a good look at him in the open water, but the late October day was a glorious one with bright skies and 90 degree tempera-

tures and offered some optimism for the events which would later unfold.

As I approached him I was unprepared for the sight of him swimming in place, against the current. He was huge! Not only was he fifteen feet long, but appeared to have a girth of eight feet. His mouth was at

least three feet wide. In addition to many hundreds of small teeth, there was a silvery reflective substance lining his upper mouth - presumably this aids in attracting plankton. How strange he looked in the kelp beds of Southern California where I have so frequently dived. Past images of rays,

colorful sheephead and ubiquitous bright orange garibaldi were at once eclipsed.

It was difficult to imagine that not until 1976 was the first megamouth discovered off the coast of Hawaii. The few other sightings have taken place in no particular area of the planet, having occurred off the coasts of Australia and California. This megamouth weighed somewhere between 1,500 and 2,000 lbs. and had large three inch eyes with its nictitating membrane frequently closing as he struggled during transport and as he was approached by the many divers all at once.

I offered gentle caresses to his rough, scaly side in a failed attempt to communicate my empathy for his predicament. But we had to believe that the opportunity to document his species (with some reverence) would somehow serve his kind - maybe even mankind.

Otto and Catherine Elliott, the owners of the *Moonshiner*, deferred to Robert

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Lavenberg, the curator at the Los Angeles Museum of Natural History, regarding the testing and well-being of the megamouth. To see if a longer tether would comfort the shark, Robert proceeded to lengthen the rope and the megamouth responded as soon as he hit a thermocline.

After Mark Dell 'Aquila and Mike deGruy shooting video, and me shooting stills, re-entered the water, it was obvious that the shark was reinvigorated and he actually swam through some of the kelp below the *Moonshiner*. Encouraged by this dramatic response and a chance to save the animal, a decision was made to release him into deeper waters. Once again, he was ever so slowly (approximately one knot) towed a few miles further into the open sea. The flotilla of pleasure craft did not follow us this time and we were able to dive, observe, and photograph the megamouth in a more normal state without interference.

By the late afternoon as we were running out of daylight and air in our tanks, we were surely pressing the shark's patience. The animal was quickly tagged and a small muscle sample taken for research into the shark's physiology. The megamouth responded positively by swimming immediately to deeper waters - not feeling the least amount of bonding with his captors. Upon seeing his new strength and spirit, I believe it was I who felt more invigorated.

The shark's signals received back from the electronic device attached to him have already proven valuable in tracking him and his habits. Within the first 24 hours the megamouth swam nearly 25 miles from the point of his release and that night ascended to fourteen feet in an obvious effort to feed. On the following morning he was observed (by the tracking device) to descend to his more normal depths which are believed to be in the 700 foot range. How fortunate we were to experience, touch, and be touched by this event and know that he would live on to further insure the survival of the species.

A word of thanks should be offered to Robert Lavenberg, Mark Dell 'Aquila and Mike deGruy for this historical opportunity and their professionalism, as well to the generosity of the *Moonshiner*'s owners.

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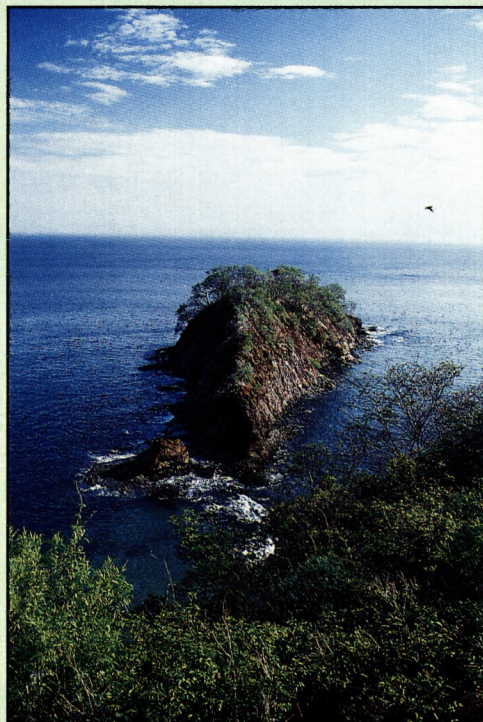


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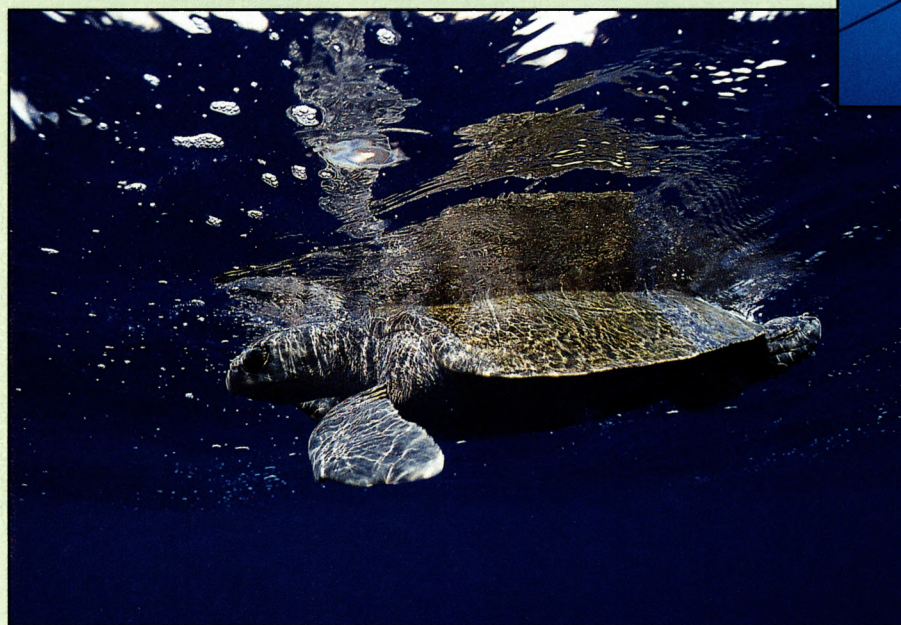
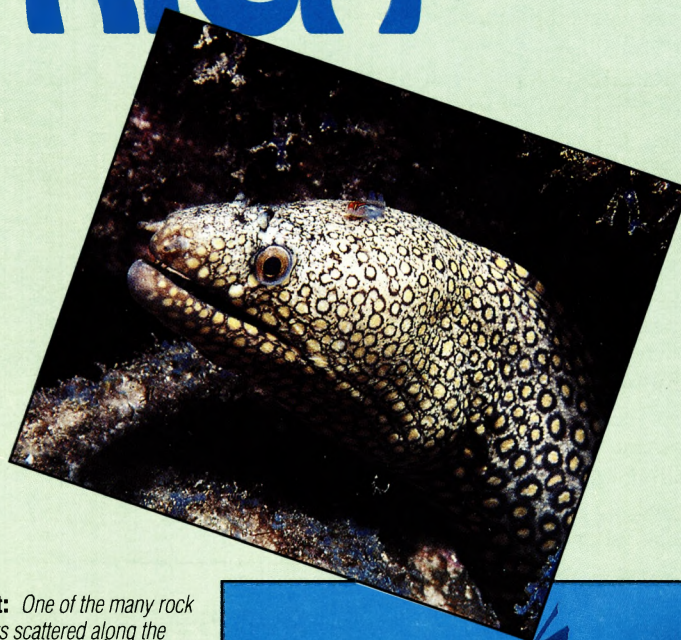
COSTA RICA



Left: One of the many rock islets scattered along the Gulf of Papagayo.

Top Right: Jewel moray having some bothersome parasites removed by a red face goby.

Right: Pacific sailfish.
Below: Olive Ridley sea turtle.



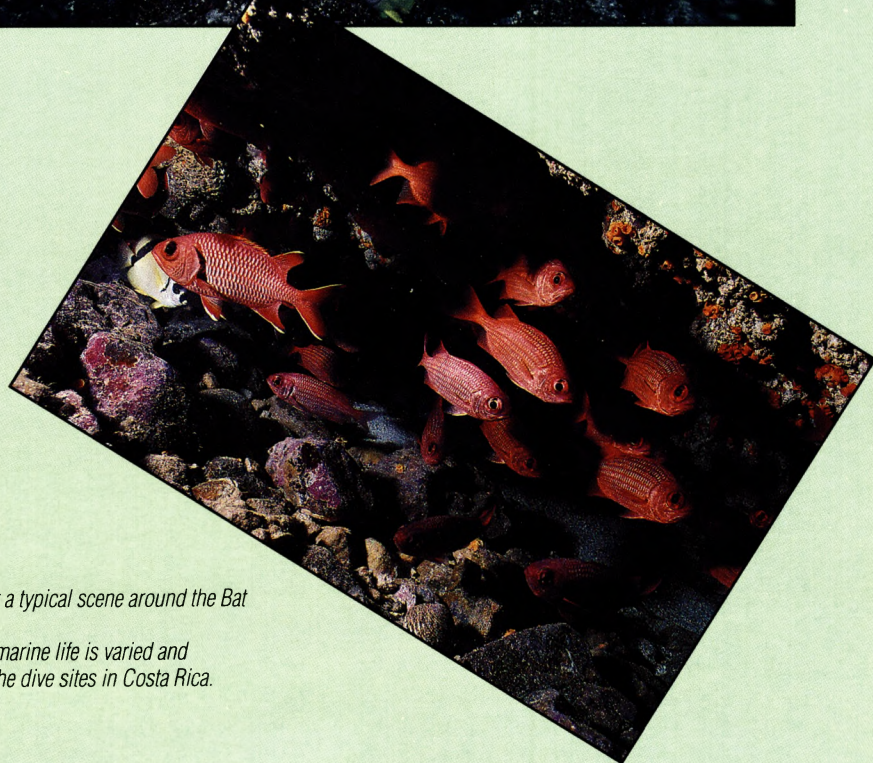
In a short period of time, less than five years, the diving community has seen the emergence of Cocos, an island approximately 300 miles off Costa Rica's Pacific coast. This locale has the reputation for being one of the "hottest" dive/travel destinations for experiences with large marine animals. For the most part, this has been shared only by the likes of exciting and unique places such as Baja, California and the Galapagos Islands. Costa Rica, on the other hand, has a lot more to offer than just Cocos Island, particularly for the diver searching for sharks, mantas, and other forms of large pelagics.

**Text and photography by
Walt Stearns**

I was first attracted to the idea of diving the Pacific coast of Costa Rica during a sailfishing trip I had taken to the Guanacaste region back in 1977. To say the least, that trip was anything but uneventful. During the course of one week of fishing around such notable sites as the **Catalinas** and the **Bat Islands**, we had just about every lure and bait rig used eaten alive by large dolphin fish, wahoo, rooster fish, large groupers, snappers and sailfish, including one 128 lb. sail that I had taken on 15 lb. test. The impression that the trip had left on me was one of burning curiosity as to what one might encounter while diving some of these areas. However, at that time there were no dive operations of any kind to be found in Costa Rica.

GUANACASTE REGION

Encompassing the entire area of the Golfo De Papagayo (gulf of the rooster), is the Guanacaste region, Costa Rica's most north-western coast facing the Pacific Ocean. This area consists of 75 miles of some of the most wild and almost inaccessible coastline to be found. Less than fifteen years ago, before the region was first recognized as becoming one of the world's truly premiere destinations for world-class, blue water sportfishing, particularly large marlin and record-sized sailfish, the coastal region was, for the most part, undisturbed. Through the development of a few fishing camps in this region some twelve years ago, the potential for exciting diving in Costa Rica was given the opportunity to emerge. Only recently, because of the attention that Cocos Island has gained, has Costa Rica achieved its own stature as a prime destination for the adventuresome seeking the opportunity to dive with larger forms of marine denizens.



Above: Just a typical scene around the Bat Islands.

Right: The marine life is varied and abundant at the dive sites in Costa Rica.

Travel Guide

THE COUNTRY

About the size of the state of Virginia, 152 miles wide by 256 miles long, the Central American country of Costa Rica holds a vast amount of natural beauty and resources in the form of first class sportfishing (on both the Caribbean and Pacific coasts), rich farm lands and some of the most spectacular tropical rainforests in the world (which are protected by Costa Rica's own National Park system). Unlike its next door neighbors, Nicaragua (to the North) and Panama (to the South), Costa Rica, with the exception of their Coast Guard, has no military forces. Furthermore, the country is governed by a democratic system that has sustained a peaceful coexistence, free of political and local unrest. This could be explained by the fact that the Costa Rican people have the highest literacy rate in Central America. It is one of the first countries to establish a compulsory and free public education system. Due to its neutral position, Costa Rica has not involved itself in any global conflicts since the end of World War II, earning the title "the Switzerland of Central America."

DIVE OPERATIONS

There are currently two competent land-based operations for handling divers. **Diving Safaris**, operating out of El Ocotil, near Plays del Coco on the Gulf of Papagayo, is equipped for ventures to the Bat and Catalina Islands. A recent addition to Diving Safaris' operation is a 53 ft. sailboat which handles 4 passengers for 2 to 6 days of diving in and around both the Bat and the Catalina Islands. Routinely making trips to the Catalinas, and the adjacent area to the south, is the Flamingo Beach Resort.

Making trips to Cocos Island for approximately 12 days at a time are three stately liveaboard operations. The *Okeanos Aggressor* is a 120 ft. vessel, fully outfitted for 18 passengers. The *MV Mystique* is an 82 footer with accommodations and facilities for 12 divers, and the latest entry, the *Undersea Hunter*, is an all-new 90 footer designed to handle 14 guests.

WHAT ELSE TO DO

Diving or even sportfishing are by no means the only things to do when visiting Costa Rica. Scattered throughout the country's interior are magnificent rainforests, which are designated National Parks, and are readily available for exploration. Inside these parks, visitors can partake in hiking, camping, bird watching and whitewater river rafting or kayaking. Visits to these locations can be arranged through most travel agencies as well as through some dive operations there.

IMMIGRATION REQUIREMENTS

A valid passport is required to enter Costa Rica. Other forms of identification are not necessary. There is no entry fee but a \$5.00 per person departure tax is collected at the airport.

RATE OF EXCHANGE / CREDIT CARDS

At present, the U.S. dollar is worth 91.35 Colones in their country. Visa and Mastercard are honored at most of the resorts and restaurants.

LANGUAGE

Spanish is the official language and is widely spoken throughout the country. English is the second language, but is not commonly used.

WHEN TO GO AND WHAT TO BRING

Being close to the equator, the climate is both hot and humid with some cool breezes at night. Average daily temperatures are normally in the mid to upper 80's by day and the low 80's at night. Attire is casual with summer clothes suitable throughout the year. The best time to go to the Guanacaste region is during the rainy season, June to September when the seas are at their calmest and the underwater visibility is at its best (50 to 60 ft. with it often reaching 70 to 90 ft.) During this time period, full wetsuits may not be necessary. Water temperatures can vary from as low as 69 to as high as 82 degrees due to the upwelling of deep water currents. A partial wetsuit and/or wetskin of some type is strongly recommended because of the thick growths of barnacles and stinging hydroids covering the rocks. A full wetsuit is recommended during the windy season, November through April, when water temperatures are colder (65-75 degrees F) due to a more constant upwelling generated by high winds.

GETTING THERE

Lacsa Airlines has direct non-stop flights from Miami, Houston and New Orleans, to San Jose, Costa Rica. Flights from California make stops in Mexico. Other airlines include Pan Am and American. It is a good idea to be at the ticket counter two hours before departure time or you run the risk of being bumped off your flight, regardless of confirmed reservations. Once in San Jose, ground transportation is usually arranged and provided by the resort.

here they do. In addition to the profuse fish population, five genera of sea turtles make their annual calling to Guanacaste's protected beaches to lay their eggs, the Pacific Olive Ridley being the most prevalent of the species.

Located on the northern fringe of the Gulf of Papagayo, the Bat Island's steep basaltic rock formations protrude high above the surface, giving only a solemn testament of what waits below. Diving around the Bat Islands gives me a perspective somewhat like exploring the tips of underwater mountains. It is truly an exhilarating feeling, being surrounded by so many large schools of fish.

One of my most memorable dives in the Bats took place on a site better known as the "Big Scare" at **Sailfish Rock**. Sisinio Alvarado, one of the regions resident divemasters, and I made our way along the rocky contours of a steep underwater slope. Finding an appropriate point for watching and waiting to see what might pass by, we stopped to begin our vigilance as schools of jacks, rainbow runners and other assorted bait fish began to swirl about us. Absorbed by their graceful ballet, this mesmerizing spell was soon lifted by Sisinio's motion for me to look toward the deeper end of the slope. From the edge of our visual range, two large gray shapes began to make their appearance. It would have been an understatement to say we were no longer alone at this time. In a matter of seconds we were accompanied by two reasonably large, 9 to 10 foot, bull sharks (*Carcharhinus leucas*) who had now made us the subject of their own inspection. While still maintaining a fair distance from us, they were quickly joined by two more, slightly smaller 6 to 8 foot members of their species. The general nature of these requiem hunters is not to be taken lightly, considering the fact that they are up on the top ten list of best known bad actors.

Soon after Sisinio and I had overcome our initial rush of adrenalin, we noticed our friends were as leery of us as we were of them. As quickly as they appeared, their own curiosity faded and they quickly made their return back into the shadows of the surrounding blue-green void. We could no longer see them, but we knew they were not far.

Such sites as **Sailfish Rock**, **Amberjack Rock** and **Black Rock** (the latter two being submerged pinnacles with only the tips breaking the surface), will normally yield huge schools of crevalle and amberjacks, rainbow runners, small tuna, groupers and cubera snappers (Pacific dogtooth snapper, some 40 to 80 lbs.).

Over the past couple years I have traveled to the Guanacaste region several times, to both the Bat Islands and the Catalinas. On each trip I was presented with an unusually high quantity of fish life seldom seen in other parts of the

world. Strangely enough, just about every kind of fish I came across, including some varieties that do not normally school, were congregated in massive numbers. It is difficult to picture butterfly and angel fish moving in schools, but

In comparison to the Bats, the Catalinas, at the south end of the Gulf, are spread out over a much larger area. Harboring several partially and fully submerged pinnacles of their own, the quantity of larger fish life in the Catalinas is not quite as prolific as that found in the Bat Islands. However, they still present a good chance of diving with mantas or a school of spotted eagle and/or golden rays, as well as sea turtles, white-tip reef sharks, schools of jacks, blue runners and grunts which typically aggregate around these submerged rocky summits. In addition to the populace of smaller reef fish inhabiting the rocky crevices, there is also a wide assortment of invertebrates like colorful nudibranchs, flatworms, shrimps, crabs and sea stars awaiting discovery.

Inside the Gulf itself are two sites called **Surprise** and **Viradoc Rock**, an inshore group of pinnacles which rise up from a depth of 80 feet. This area is still fertile with enough marine life to intrigue even the most seasoned diver.

During one dive I happened upon a sizeable 90 to 100 lb. jewfish who graciously provided me a brief moment to model for some pictures, as well as a phenomena I have heard of but never thought I would have the chance to witness. Encompassing what was surely several thousand, was a massive school of grunts that had congregated next to Viradoc Rock. So extraordinary was their assemblage that the school virtually eclipsed the light from the sun as they passed over me. Who would think that such a thrilling spectacle could be provided by something as mundane as a simple grunt.

Besides the high numbers of reef predators and various species of pelagics, the coastline pinnacles are also home to a robust populace of colorful reef fish, including varieties of angel fish, butterfly fish and damsel fish. What makes it even more unique is that some of the same species of fish characteristically found in the Caribbean are also found here. I have observed several species of tropical reef fish

that are identical to species indigenous to the Caribbean; porkfish, soapfish, creole fish, beaugregory damsels, barred cardinal fish and flame fish, to name a few.

The diversity and exceptional quantity of marine life in Costa Rica is by no means accidental. From deep below, currents transporting colder, nutrient-rich waters periodically upwell along the coastline, providing in combination with photosynthesis, a thick community of plankton in the upper water column. These large scale planktonic blooms supply the necessary food resources essential for supporting such an intense populace of marine life. This includes the smaller animals that feed upon plankton, like sardines and other small fish fry which in turn become food for the larger predators.

The very same currents that transport these nutrient-laden cooler waters are also the predominant cause for the little to almost nonexistent growth of the harder stoney corals as well.


DIVE COSTA RICA El Ocotal

Located on the fringe of 75 miles of wild inaccessible coastline, most dive sites are undisturbed. Really very few spots have even been seen by scuba divers. Not only will visiting divers be in virgin waters but they will actually take part in the exploration and naming of new dive sites. Most dives will be around rock formations from 20 to 100 ft. depths. There are no live coral reefs. In the place of coral formation typical of Caribbean dive destinations, divers will see an astounding variety and unimaginable numbers of fish, soft corals and invertebrates. With visibility between 20 to 90 feet and water temperatures a steady 75° to 85°F and air temperatures of 85° to 90°F year round, each day is a unique and pleasant diving experience. If it's big fish you'd like to see, there are the Catalina and Bat Islands a 30 minute and one hour run respectively from El Ocotal. In these mostly unexplored waters, grouper, snapper, jacks, sharks and mantas abound. These areas are best enjoyed by advanced open water divers seeking new thrills and challenge. The many local dive spots within a 20 minute boat ride are home to huge schools of tropical fish, many indigenous only to Costa Rican waters, a whole spectrum of colored soft corals, an array of star fish, crustaceans and shells. No matter how vast the divers' experience, every single dive will yield new discoveries in marine life forms.

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Above: Typical sunset in Costa Rica.

Right: This yellow-napped Amazon parrot is one of the many species of parrots indigenous to Costa Rica.



The rock formations are anything but barren, adorned with an array of benthic communities such as clusters of encrusting sponges and barnacles, red and pink colored gorgonians, colonial anemones and small clusters of white hydrozoans and black coral in the deeper depths.

On a slightly darker note, the sparkling clear visibility normally encountered in the Caribbean is not commonly seen here, even on the best days. On the average, the underwater visibility ranges from 40 to 50 feet during the windy season (December-March), with it sometimes reaching as high as 80 to 90 feet during the prime season (June-September). But for brief periods and with no warning at all, visibility can drop to as low as 20 to 30 feet, changing rapidly, within minutes or days, and sometimes lasting for more than a week at a time. Ironically, it is during these periods that the richest numbers of marine life gather which is due to the higher concentration of plankton which makes for better feeding. For an underwater photographer, it appears to be in somewhat frustrating proportions. Optimistically, this does make for a challenge to capture those most rewarding and exceptional shots.

Even though there are already dozens of

dive sites to visit around the Bat Islands, with many more in need of discovery, the coastal waters of the Gulf of Papagayo are largely unexplored. Most of the dives are conducted in depths ranging from 40 to 100 ft. along the steep slopes and vertical walls of both the Bat and Catalina Islands. It is important to note, many of the rock pinnacles in the Bat Islands rise up from depths of 250 ft., which makes it easy to accidentally stray into deeper depths. Undoubtedly, this is no place for the beginner.

COCOS ISLAND

Approximately 300 miles from the coast of Costa Rica, like a lone emerald on a vast carpet of blue velvet, lies Isla del Coco (Cocos Island). Almost entirely covered by rain forest, the 20-square mile volcanic island is only accessible by boat, thus remaining the largest uninhabited island in the Pacific, and conceivably the world.

Believed to have been the original model for Robert Lewis Stevenson's novel "Treasure Island," Cocos' own history abounds with tales of buried treasure left by the buccaneers who prayed on Central and South America's Pacific coast. Throughout antiquity, few islands have

been better able to intrigue man's imagination with rumors of lost riches than Cocos. Over the years many have tried in vain to find the treasure, only to give up in despair without ever discovering a even trace.

In 1978, for concern over the destruction of its natural resources, the Costa Rican government proclaimed Cocos Island part of their National Parks, keeping it off-limits to would-be treasure hunters. To this day, most of the island's natural attributes go unhindered. Cocos' true riches, however, are the abundant marine life occupying its surrounding waters.

Blessed with underwater clarity, (most commonly 70 to 90 ft., and sometimes beyond 100 ft.), it is no rumor that Cocos is one of the best places to find sharks, huge manta rays, turtles, large schools of jacks and the occasional passing school of tuna as well. All have been seen by many a fortunate diver.

According to present surveys, more than eight species of sharks roam her waters due to the areas plentiful food supply and isolation from man. Most of the species include white-tip and black-tip reef, Galapagos, oceanic, mako, tiger, hammerheads (which are often seen in large schools), and an occasional whale shark.

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The Discovery and Demise of THE MYSTERY PLANE OF SCOTSMAN'S COVE

By Dr. Samuel Miller



Photo by Charles Gibbs

Diver discovers sunken plane

Navy salvage crews today are preparing to reclaim the bodies of the crew of a World War II military aircraft from the sea off Laguna Beach.

The barnacle-encrusted plane, believed to be a torpedo bomber that normally carries a crew of three was discovered Sunday by a skin diver seeking a fellow skin diver who drowned recently.

Marine Cpt. Thomas B. Fuller of El Toro Marine Corps Air Station was searching for the missing man in 90 feet of water off the shoreline when he suddenly came upon the aircraft.

The aircraft was intact and covered with a heavy layer of barnacles. Its canopy was blackened due to the chemical action of salt water on the plexiglass.

"I tried to open the cockpit, but it was locked," Fuller said.

"There seemed to be no escape hatches open, but there was a hole in the canopy as if the pilot had tried to break out."

Speculation as to when the plane might have crashed into the sea was rampant throughout Orange County today, as authorities checked and double-checked records of air crashes during and since World War II.

Orange County Register news release January 18, 1961

Above: Eric Hanauer hovers over the skeleton of the Corsair wreckage.

Left: In December 1977, the ocean gave one final look at the Corsair before she destroyed it. Visibility off the coast was over 70 feet; the plane could be seen from the surface. After the ensuing winter storms, she was broken up.



Photo by Eric Hanauer

It was 1961 — diving had just emerged from infancy and was slowly entering puberty. The double hose regulator was the regulator of choice. It was the year the tank back pack was popularized. It was also the age of exploration. Divers were going deeper and farther from shore. Unfortunately, accidents from diver error and equipment failure were reaching alarming proportions. It was for these very reasons that a World War II aircraft was discovered off Scotsman's Cove. The above article from the Orange County Register dated Jan. 18, 1961, tells the story surrounding the discovery.

Immediately after the publication of the article, rumors ran rampant. In addition to being a WWII American plane, it was also a WWII Japanese bomber, and a Russian spy plane. It had just crashed and it had crashed 20 years before. No one really knew for sure. It took the considerable efforts of the Long Beach Naval Station E.O.D. (Explosive Ordinance Disposal) under Lt. Commander "Tommy" Thompson to solve the mystery.

THE WAY IT WAS...



Photo by Eric Hanauer

Although the Corsair saw combat for over 20 years (World War II through French Indo China), only about a dozen of them are still flying.

A navy vessel, specially equipped for diving was dispatched from LBNS with Lt. Commander Thompson, EOD divers and Marine Corporal Fuller to locate the wreckage. It was assumed that it would be found

well over a mile offshore, it was discovered sitting upright in the sand. The mystery was solved. It was a WWII U.S. Navy fighter, a single seat plane, the famous Chance Vought Corsair F4U. It was as if it had been

within a normal diving depth and within a normal diving distance from shore. Therefore, the search was organized starting inshore utilizing the most advanced technologies available in 1961. A week passed, no plane, two weeks passed, still no plane. Finally into the third week at a depth of 75 feet and

gently placed on the water and allowed to sink slowly. Everything was intact. The machine guns were in the wings, the cockpit was vacant, "the bodies" were the seat padding which was slowly deteriorating into cloudy balls of cotton. The EOD returned to port and considered the search a success. Sometime later, Washington called. "Please locate the aircraft again, remove the engine and machine guns for evaluation of the effects of prolonged submersion in salt water." So... out they go again, relocate the plane, unceremoniously rip off the engine and machine guns and return to port, post haste. Fifteen years later, in 1974, the plane had been all but forgotten except for a noble few. Eric Hanauer was slowly motoring in his specially equipped dive boat looking for new and unexplored reefs. Suddenly there was a strange configuration on his depth finder. A diver was dispatched to investigate. He

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discovered the WWII Corsair sitting on the sand minus its engine and armament. After numerous dives and considerable exploration of the area, Eric was ready to write an article. It was published in a 1977 issue of *Skin Diver* magazine describing the plane and its discovery. Numerous older divers called him to tell the story of the 1961 events. Suddenly his discovery became a "re-discovery". One by one, Eric invited his close friends to visit the Corsair. I made several dives on it. Sure enough, it was lying on the sand slowly deteriorating.

The final mystery of how and why it crashed was solved by Tommy Thompson. He met and interviewed the rescuer who was surfing that day when it crashed in 1948. The pilot had just taken off when he began experiencing engine trouble. He went out over the ocean, turned, and was headed back when he opted to ditch at Scotsman Cove. According to the witness, he came in low, eased down, made a perfect ditching. He got out of the plane with an injured leg, but managed to inflate his vest and one-man life raft and was on his way towards shore when the surfer reached him.

In 1979, California experienced one of the worst storms to hit the coast in years. This storm and an unknowing careless boater spelled doom for the Corsair. It is difficult, almost impossible, but the wave action at 75 feet had a destructive effect on the Corsair tumbling it about. The boat's anchor caught the plane just aft of the cockpit and further pulled it apart, creating an underwater junkpile. It was at this time that Eric decided to remove the propeller and the tail wheel as a memento. These were placed on his patio for a few months, but being the conservationist and the gentleman that he is, he decided that the propeller and wheel should be reunited with the remains of the Corsair. So Eric, in one final tribute, replaced these items in their proper place, relative to the body to let it lie undisturbed in these, its later years.

So ends the story. The mystery of the plane at Scotsman Cove, the Chance Vought F4U Corsair, crashed 1948, discovered 1961, re-discovered 1974 and placed to rest in 1979. May it rest in peace.

Note from Eric Hanauer, December 1990:

A couple of years ago, a friend of mine swam by the plane and didn't even recognize it as an airplane, even though he had been on it before. Please don't try to

find it. The ocean has dispersed the wreckage and it is unrecognizable. The history is all that remains of this Corsair wreckage.

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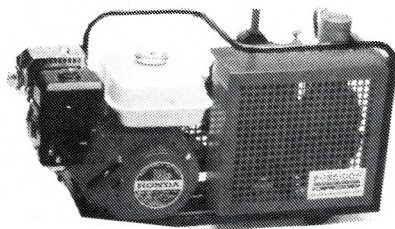
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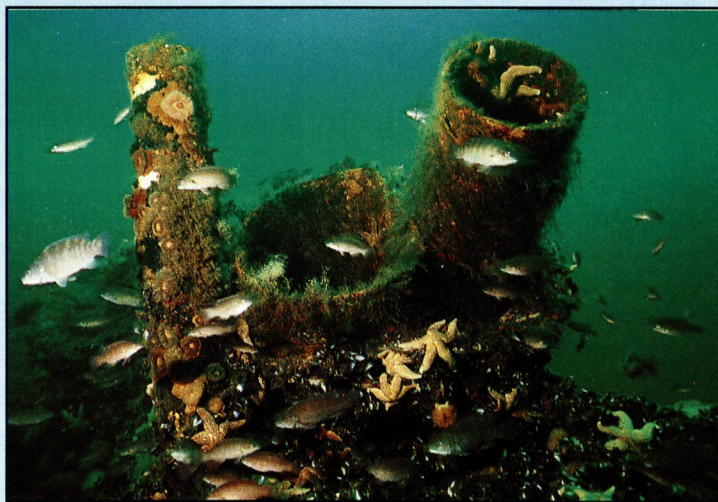
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NEW JERSEY'S SEA GIRT ARTIFICIAL REEF

The bottom terrain off the New Jersey coast is flat and sandy, very much like a desert. This underwater desert has its nomadic inhabitants that roam across the shifting sand. Species like the winter flounder, summer flounder (fluke), little and clearnose skates, moon snails and hermit crabs make their home on the sandy bottom. In order for any population to exist in a desert, it must have its oases. These exist as shipwrecks and artificial reefs. They provide footholds for the building blocks of the marine community as well as havens for reef fish. The waters off New Jersey are blessed with more than 2000 shipwrecks and artificial reefs. They are found from the shoreline to waters too deep for the sport diver. The most popular are in the 60' to 100' range.

The first artificial reefs were ships that reached the bottom because of storms, collisions, navigational errors and war. Modern navigation devices, superior ship building and the lack of war have almost eliminated new reef additions. Meanwhile, the corrosive effects of saltwater and the crushing effects of currents and storms reduce reef numbers. To increase these numbers, the State of New Jersey implemented a formal management plan in the 1980's to build biologically sound artificial reefs. It is one of the most aggressive programs in the country. Their construction materials are ships, concrete bridge rubble or car tires filled with concrete. The results are oases in the underwater desert that serve as communities for marine life and ideal sites for fishermen and scuba divers.

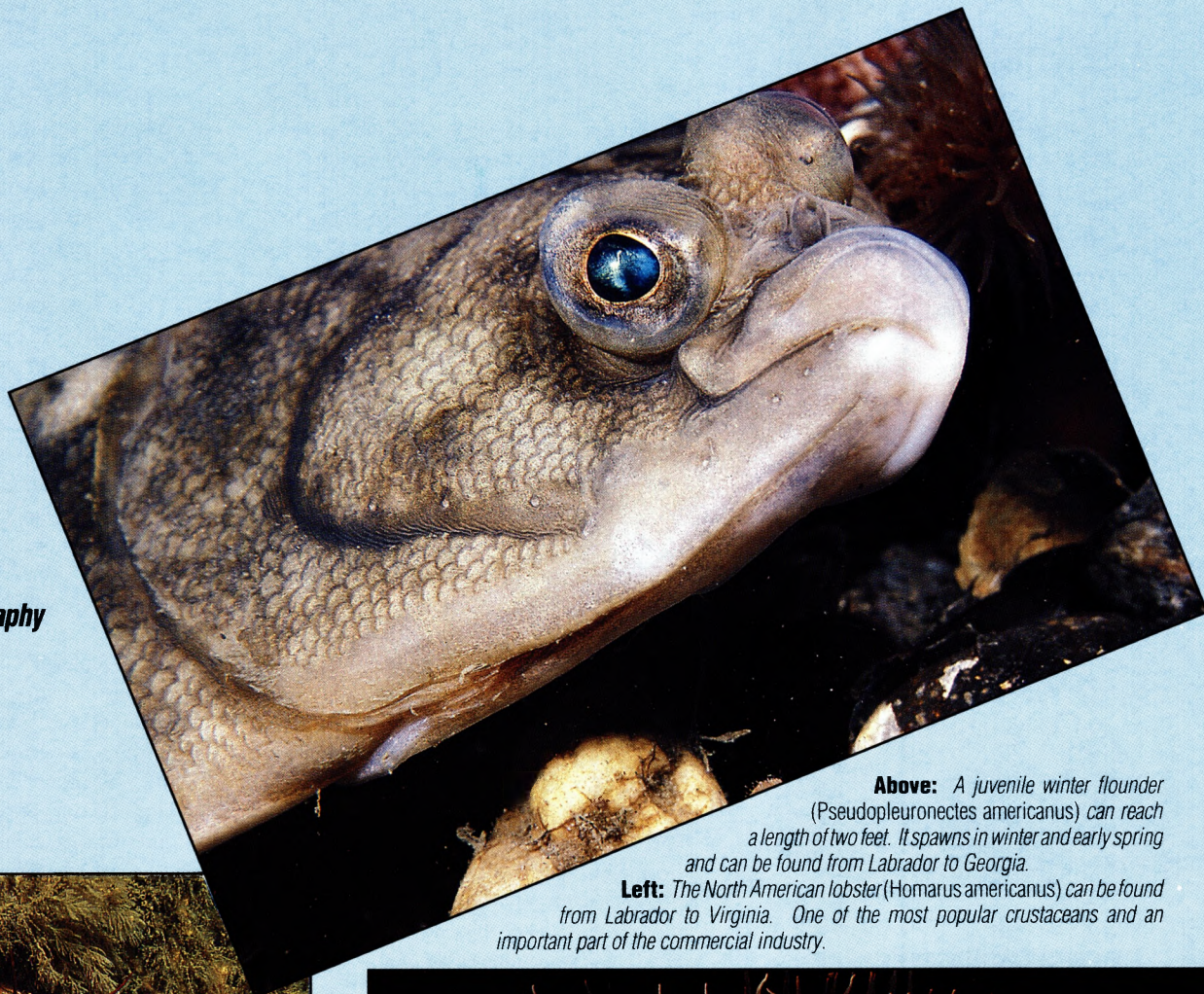


The Spartan, a 90 foot pilot boat sunk as part of the artificial reef system in New Jersey. Depth of the wreck is approximately 70 feet and it lies 3.25 miles east of Manasquan, NJ.



The Asteriid sea star (Asterias forbesi) is a common species south of Cape Cod. Found intertidally to subtidally down to 150 feet. The range is from Penobscot Bay to the Gulf of Mexico.

**Text and photography
by Herb Segars**



Above: A juvenile winter flounder (*Pseudopleuronectes americanus*) can reach a length of two feet. It spawns in winter and early spring and can be found from Labrador to Georgia.

Left: The North American lobster (*Homarus americanus*) can be found from Labrador to Virginia. One of the most popular crustaceans and an important part of the commercial industry.



The frilled anemone (*Metridium senile*) lives intertidally to subtidally to 500 feet. The range is from the Arctic south to Delaware Bay and it our most common and largest anemone.

One of my favorite artificial reef areas is the **Sea Girt Reef** that lies equidistant from Manasquan and Shark River Inlets. Approximately five miles offshore, it encompasses an area about three miles long by three-eighths of a mile wide. There are twenty-seven different reef sites in that patch of ocean. They are visited regularly by all commercial dive boats from Shark River and Manasquan Inlets, especially when the wind is blowing hard out of the west, making shore diving very uncomfortable.

As I loaded gear aboard my boat, *Snapshot*, on a warm summer morning, I looked forward to a day filled with artificial reef dives. The first stop was the 85 foot long canal tug, *Spartan*, which sits upright on a sandy bottom in 70 feet of water. The top of the ship is at 50 feet making it ideal for novice divers. Getting lost on the wreck is nearly impossible due to its small size. Many instructors bring classes here for

their first offshore dive. Local dive shops feature introductory wreck diving classes with the *Spartan* as their ocean classroom.

My dive buddy, Joe Pakan from Colts Neck, New Jersey, and I descended the anchor line. As we approached the wreck, I could see that we were hooked into the stern. After checking the hook, we swam along the starboard side of the boat to the bow. I reminisced about my first dive on this site in the summer of 1986, shortly after the *Spartan* had been sunk. There was a minimum of growth on the ship, so little that the name was clearly visible on the stern quarters. The change in a few years has been dramatic. There are no bare areas on the hull or superstructure anymore. Hydroids cover all the rails while blue mussels fight for space on the hull and decks with beautiful frilled anemones. Armies of sea stars roam the mussel beds looking for their next meal. Schools of bergalls (cunners), a reef fish equally as curious and hungry as the yellowtail snappers of the Caribbean, roam the ship from bow to stern. Their curiosity turns them into pests as I try to frame portions of the ship in my camera viewfinder. Black sea bass and blackfish (tautog), two popular gamefish species, are more difficult to approach but equally abundant. An entire dive on the ship is possible without dropping off the deck to the sandy bottom. The walkways along the sides of the ship are unobstructed. Divers can swim from the bow to the stern, making stops to look into passageways and through openings that once housed portholes. A large rectangular section of the top deck has been removed allowing access to the empty engine room. The 40' x 15' opening provides plenty of light. New divers can get the feeling of wreck penetration without any of the danger.

Although the ship is alive with life, the sandy bottom surrounding the *Spartan* is equally interesting. Sand dollars, easily distinguished by their pentamerous (five-sided) design, push their way through the sand looking for food. These members of the sea urchin family are tan to reddish-brown in color when alive. Divers shouldn't take live specimens for wherever live sand dollars are found, there are always great

numbers of white-colored shells, left after the urchin dies. Winter flounder bury themselves in the sand with only their eyes protruding, waiting for an unsuspecting dinner guest. I have often been startled as the sand beneath me explodes due to the hasty exit of the flatfish. Sea robins, a nuisance fish for flounder and fluke fishermen, scurry across the bottom in their quest for nourishment. Hermit crabs quickly retreat into their shells as I try to slip my macro framer beneath them. In the spring, fall and winter, ling (red hake) hug the perimeter of the ship where the hull meets the sand.

Visibility on the *Spartan* varies from day to day. There are periods when it can exceed 40 feet but the average is about 10-15 feet. An attribute of the ship is its high profile off the bottom. When waves and current stir up the sand, the upper portions of the ship can still have good visibility. Bottom temperatures in the summer and early fall reach into the upper 60's, very comfortable for 1/4" wetsuits. Cold air temperatures in the early winter and cold water temperatures in the early spring make dry suits very appealing.

Underwater photographers have a multitude of subjects at their disposal. When visibility is good, the shallow depth of the ship allows the wide angle photographer opportunities to match flash and available light. The intact features of the ship make it an ideal photographic subject. Hydroids, mussels, starfish and sea anemones on the upper sections of the ship provide a limitless supply of subjects for the macro and close-up photographer. Dropping down to the sand adds many others.

Spearfishermen will find the blackfish (tautog), black sea bass and ling to their liking. Artifact hunters may find a piece of brass but will have to go into the ship to do so. Lobstering on the wreck is really hit and miss. Because the *Spartan* is small and intact, the hiding places for lobsters are limited. There are a few boxes on the upper deck that should be checked for I have seen divers pull bugs from them. More experienced divers may find the *Spartan* too tame for their appetites. New divers, photographers and spearfishermen will not be disappointed.

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A wonderful second dive or an alternative dive site if the *Spartan* is occupied is the *Cranford*, a 205 foot long ferry boat donated by the Ashley Development Corporation. It was sent to the bottom in March of 1982. This is a large wreck that is not easily recognizable as a ship, having been ravaged by the effects of sea water and storms. It lies in 70 feet of water on a sandy bottom and is home to a great variety of marine life. Her large footprint provides plenty of wreckage for divers to explore. Her bow section rises about 20 feet off the bottom. There are many nooks and crannies that house North American lobsters, ocean pouts and American conger eels.

On this dive, Joe will buddy with Beth Dalzell of West Orange, New Jersey who has brought along her video camera. I will dive with Tony Aurilio of Old Bridge, New Jersey, whose plan for the day is to do some sightseeing and perhaps catch a lobster or two. As I move down the anchor line I know that Beth will be thrilled. The visibility is excellent, in excess of 30 feet. My plan for the day is to skirt the edges of the wreck and then move into the sand to see what marine life I might find. I notice an abundance of blackfish and black sea bass when I get to the bottom, many of which are on the higher portions of the bow.

I drop off the edge of the wreck and see flounder moving across the sand. I move in close to take a photograph and realize that my subject is a summer flounder, also called a fluke. For those divers who have difficulties distinguishing a fluke from a winter flounder, look at the size of the mouth. The fluke has a large mouth, distinctly larger than the very small mouth of the winter flounder. During the summer and fall dive season, the winter flounder is the fish that is seen most often on the wrecks. The fluke are found inshore along the beaches and in the inlets. I took this opportunity to capitalize on my good fortune, shooting many photographs of the fluke.

As I swam further from the wreck, I noticed a fish partially buried in the sand. I was amazed that it looked just like a lizard fish (sand diver) that I have seen in the Caribbean. With more than four hundred New Jersey dives under my belt, I thought that I was familiar with the marine life. This

was a new one for me. Fascinated, I watched its behavior awhile. It would pop out of the sand, swim a little, stop, shiver and sink into the sand so that only a portion of its head protruded. It was very aware of its surroundings. I could photograph the entire fish from a few feet away, but when I moved in for a close-up, it would swim away. Later, my research showed that it was an inshore lizard fish. A phone call to my friend Bill Figley, of the Division of Fish, Game and Wildlife, confirmed my findings. He told me the inshore lizard fish is very common off our coast. Well, it had never been common for me before and I was very happy to have had this encounter.

On the edges of the wreck, I watched sea robins playing and eating in the sand. Silvery colored scup (porgies) seemed to be searching for the same food as the sea robins. Rock and Jonah crabs backed into nooks and crannies of the wreck. The early warning system of the North American lobster, its antennae, protruded from a hole in the wreck. I laid there and watched the lobster come completely out of the hole and then retract slowly, giving me a great sequence of photographs.

Tony and I ended our dive on the high section of the bow where we watched black sea bass, blackfish and bergalls moving in many directions in their seemingly endless search for food. There are species of marine life that I have encountered off the coast of New Jersey that are very special. I consider every encounter with one of these a remarkable event. I was about to have one of these special moments. Tony started up the anchor line. I followed but stopped 15 feet off the bottom to take one last look at the *Cranford*. I looked toward the bow and there was an ocean sunfish, a true gentle giant of the deep. I have seen and photographed them on the surface but have only had one other encounter with a sunfish on the bottom. It swam along the length of the wreck and came within ten feet of me. I looked at my bottom time and knew that I couldn't dilly dally and follow the sunfish on its underwater tour. I smiled, waved, watched as long as I could and headed for the surface.

The 70 foot depth at the *Cranford* provides plenty of bottom time. It is a dive

that a novice can make comfortably. It is certainly suitable for any level of diver. Its large size and abundance of fish life make it ideal for the sightseer, underwater photographer and spearfishermen. Visibility is similar to that found on the *Spartan*.

These are just two of the sites on the Sea Girt artificial reef. There are twenty-five more that wait for the visiting scuba diver or fisherman. All the dive sites on this reef are suitable for novice divers. Underwater photographers, spearfishermen, lobster hunters and sightseers will satisfy their needs on the artificial reef. The only facet of scuba diving that is lacking is artifact hunting. Although it wasn't all that long ago that my son, Tom, recovered a brass electrical box from the upper deck of the *Spartan*. If you would like to dive one of these sites, contact your local dive shop. They often have boats booked for daily charters. Local dive boats have days set aside for walk-on divers. To find out more information about boats and their locations, contact the **Eastern Dive Boat Association**, P.O. Box 888, Miller Place, NY 11764.

If you are new to wreck diving, consider joining a local dive club and diving with them. To get information on dive clubs throughout the state, contact the **New Jersey Council of Diving Clubs**, c/o William Loughran, Jr., P.O. Box 337, Sea Girt, NJ 08750. This may not be the Caribbean, but for those of us who love New Jersey diving, it doesn't get much better.




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THE ATLANTIC TARPON

**Text and photography
by Marty Snyderman**

It was almost midnight as I stood on the sandy bottom looking up toward the stern of the dive boat. I was lost in thought as I watched a thick school of baitfish swirl in the glow cast by the ship's deck lights. After all these years of diving, I still love to watch schooling fish move in complete synchronization with one another. And I still wonder how in the world they can possibly achieve such perfect harmony of movement. The school swam toward the dive ladder, then off to the starboard side when suddenly it scattered in frenzied fashion. There was definitely a predator in the area. In a typical Caribbean setting the hunter might be a school of jacks, a barracuda, a bull shark, or a grouper on the prowl, but tonight the fish that caused the baitfish to panic was a hungry tarpon in search of a meal.

I watched the tarpon rush the school on several occasions, but I never could tell if the hunter was successful in its efforts or if all the baitfish escaped with their lives. Soon several more tarpon showed up on the scene. They, too, wanted to take advantage of the opportunity to feed. I spent the rest of the dive watching the predators work the baitfish. I tried to approach the tarpon on several occasions, but despite their size, this night they were rather wary of human intruders.



When I returned to the boat after the dive, one of my shipmates mistakenly claimed to have seen me watching a dozen barracuda under the boat as they fed on baitfish. In his defense, he was a new diver, and his mistake is not uncommon. In fact, due to the combination of their bright silver coloration and their large size, Atlantic tarpon, *Megalops atlanticus*, are often mistaken for great barracuda, *Sphyræna barracuda*.

With just a little experience, divers and snorkelers can distinguish between the two species by noting that Atlantic tarpon have a tail that is distinctly forked, and they have a turned down mouth with a rather long and pronounced lower jaw. Great barracudas, on the other hand, have a flat, broad tail, and upper and lower jaws of similar size. Observant divers can usually see the long narrow teeth in the mouth of a barracuda while teeth

of tarpon are not usually visible from a distance. In addition, a distinctive physical characteristic of tarpon is that they have very large eyes. The name of their genus, *Megalops*, is derived from the combination of two Greek words that mean "large eye."

As we discussed the dive and the proper identification of these fish, my friend began to ask me questions about tarpon. Much to my embarrassment, about all I knew was that they are often confused with barracuda. So we headed off to the ship's library and here is what we learned.

Atlantic tarpon are among the most dramatic and unusual looking of all Caribbean fishes. Members of the Family of fishes called Elopidae, they are the direct descendants of primitive fishes, and they look a lot like their ancestral relatives from which they developed. Like many primitive fishes,



Atlantic tarpon are noted for their large individual scales which can measure more than three inches in diameter.

Atlantic tarpon are known to reach a size of 8 feet and 350 pounds. Even much smaller specimens are spectacular for scuba divers and snorkelers to encounter. This is especially true on bright sunny days because their bright silver bodies often shimmer as flickering rays of sunlight dance over their backs.

Though Atlantic tarpon are occasionally seen as solitary, they usually gather in small schools of 20 to 200 fish. The schools often hang in caves and crevices where they feed. When found in schools during the day, tarpon are usually easy for divers to approach. Tarpon make dramatic photographic subjects, but they are difficult to expose properly because their silver skin is highly reflective. Placing a thin cloth or old tee shirt over a strobe will soften strobe light. Softening the light helps eliminate the glare from their bodies in some instances.

Tarpon are widely distributed on both sides of the Atlantic. In the western Atlantic, tarpon range from Cape Cod in the north to

Brazil in the south, and they are found in many parts of the Caribbean. Tarpon are capable of surviving in both fresh water and salt water, a feat most fishes are not capable of. As a result of this ability, tarpon are commonly found in mangroves, estuaries, rivers, and other backwater areas as well as in open sea reef communities.

When feeding, tarpon prefer to prey on small baitfish, especially silversides, and some small crustaceans. If they approach the action slowly, divers who encounter feeding tarpon can often get close enough to the action to watch the tarpon "herd" the baitfish into a tight ball before suddenly rushing through the ball of bait. During periods of heavy feeding, the tarpon often pursue the baitfish for hours on end. Baitfish often gather in large caves and in shipwrecks, and the feeding activity can be both localized and intense. For divers, this is good news because once you find the tarpon feeding you are likely to be able to stay with the action for a long time. Adult tarpon tend to feed primarily at night, but during periods of heavy feeding they readily eat during the day when an

opportunity presents itself.

Atlantic tarpon are open ocean broadcast spawners. An average size female tarpon can produce as many as twelve million eggs in a single spawning. The eggs drift as far as 100 miles offshore before hatching. The hatchlings look like tiny transparent ribbons, and do not resemble the adults. Some of the larval hatchlings eventually find their way into shallow water where a remarkable metamorphosis occurs. When the juveniles reach a length of approximately three cm, the hatchlings shrink to about half their size and take on the appearance of adult tarpon. This phenomenal transformation occurs within only a day or a little longer.

Closely related to the prize gamefish known as ladyfish, Atlantic tarpon are also favorites of game fishermen. Once hooked, sport fishermen consider tarpon to be wonderful fighters that stand out for their aerial displays. However, they are rarely eaten because of their bad taste.

Watch for this predator on your next dive in the Atlantic!

TO BE IN BEQUIA

By *Hobie Hawthorne, Ph.D.
and Karen Ferran Hawthorne*

Right: *Canons at the old fort guarding the entrance to Admiralty Bay.*

Below: *An example of the many soft corals found at Bequia dive sites.*



Photo by Karen Ferran Hawthorne



Photo by Hobie Hawthorne, Ph.D.

An emerald on a sea of deep indigo. Bone white sand and turquoise water highlight their meeting. Where humpback whales play and sing in the crystal clear water. Swaying palms and tropical breezes accent colorful sailboats at rest in the inviting harbor. Sound like a fairy tale? It's Bequia; an authentic and pristine Caribbean dive location.

Well known among the world yachting community, this alluring Caribbean island presents a new and unique dive location. Several key features have helped keep Bequia (pronounced Bek-way) from becoming just another overdeveloped Caribbean island. It is currently accessible only by sea. To reach St. Vincent you must first travel to St. Lucia or Barbados and the following day, enjoy (or tolerate) a nine mile voyage across the channel to Admiralty Bay. Typically, two ferries, not coincidentally named Admiral I and II, shuttle commuters, vehicles, and goods back and forth several times a day. A locally designed gaff-rigged motorsailer named the Friendship Rose makes daily sails for the more adventurous. Speedboats are also available for those more concerned with time than money.

Right: View from St. Vincent. Young Island is in the foreground and Bequia can be seen in the distance.

Below: A wide variety of tropical marine life can be seen at Bequia.

Below right: A diver silhouette.

Photo by Hobie Hawthorne, Ph.D.



Photo by Karen Ferran Hawthorne



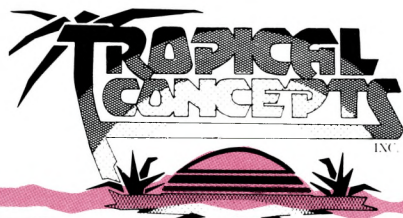
The government of Bequia, indeed of all the Grenadines, under the leadership of Prime Minister James Mitchell has adopted a prudent and seemingly wise policy of slow and well-planned growth. While construction of an airport is under way, commercial jets will never touch down. It is a small single runway project that will not transport more than a small number of tourists. It will, however, provide more expeditious transport of medical emergencies, and a welcome alternative to the more motion sensitive traveler.

GETTING THERE

Karen and Dennis Sabo, owners and operators of Landfall Productions, arranged this trip. One would be hard-pressed to find a more professional and thorough dive travel company. They provide comprehensive information on a variety of accommodations, services, restaurants, culture, airlines, and more. The information is not second hand, but rather Dennis and Karen personally develop and arrange the dive packages. Trips are not organized based on impersonal business deals, but on personal experience and friendships.

Photo by Hobie Hawthorne, Ph.D.





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DIVE TRAVEL

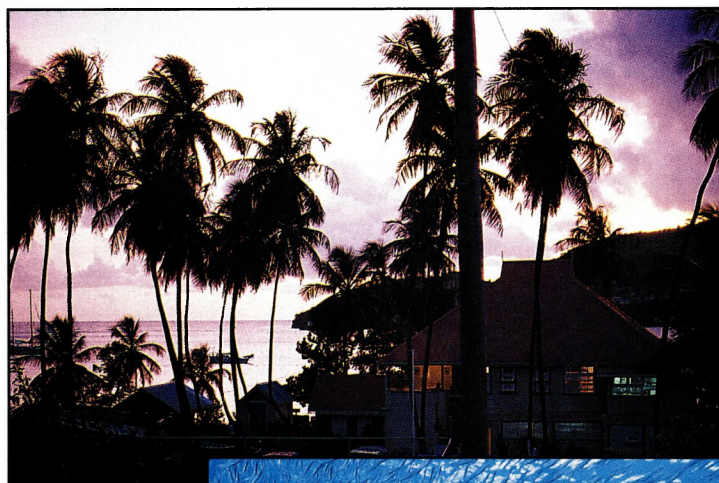


Photo by Hobie Hawthorne, Ph.D.

Above: Sunset at Sunsports.

Right: Diver surrounded by a large school of bait fish.



Photo by Dennis Sabo

As Los Angeles became more distant and Bequia closer, even the commercial air transportation improved. As the 747 unloaded its weary travelers in the crowded and noisy airport in Barbados, a fortunate few found their names clearly displayed by a smiling official of Mystique Airlines. These special few were happily whisked through customs, their baggage retrieved, and promptly placed aboard a sleek twin engine aircraft enroute to St. Vincent – A delightful change from the impersonal shuffling and waiting of the more conventional airlines.

The improvement continued. After an uneventful channel crossing, Admiralty Bay presents a strikingly beautiful and well protected harbor. A colorful sprinkling of sailboats from around the world is not unusual. Bequia's town of Port Elizabeth is nestled against the northeast shore and offers most amenities.

ACCOMMODATIONS

Principle hotels, restaurants, and dive operations can be found tastefully interspersed with palm, almond and frangipani trees. An explanation of "hotel" in this context may be helpful. The largest hotel on the bay is the Sunny Caribbee Plantation House which provides seventeen cabanas with private verandas, three luxury bungalows, and five bay view rooms in the main building. High rise hotels will not be found in Bequia.

The main boat dock lies in the center of the small town of Port Elizabeth. Most beaches, hotels, restaurants and dive operations will be found along the harborside to the South toward the Plantation House. A small footpath, which at night, or after a few drinks, can become challenging, leads south along the waterfront. However, most roads are paved and away from the waterfront.

Along the small footpath away from town are several establishments worthy of mention. One of the first encountered is likely to be the red-roofed Frangipani Hotel. The "Frangi", as it is called locally, has become a gathering place for islanders and visitors alike. This could be due to its location, which is central, having its own dock, is away from the main dock area, or perhaps it could be the "Frangi's" fine restaurant and bar with its popular Thursday night buffet. Prime Minister Mitchell will occasionally be in attendance, not as a stuffy head of state, but as a dignified and friendly gentleman and owner. Guests are accommodated in impressive stone and wood bungalows set in a tropical garden, overlooking the harbor.

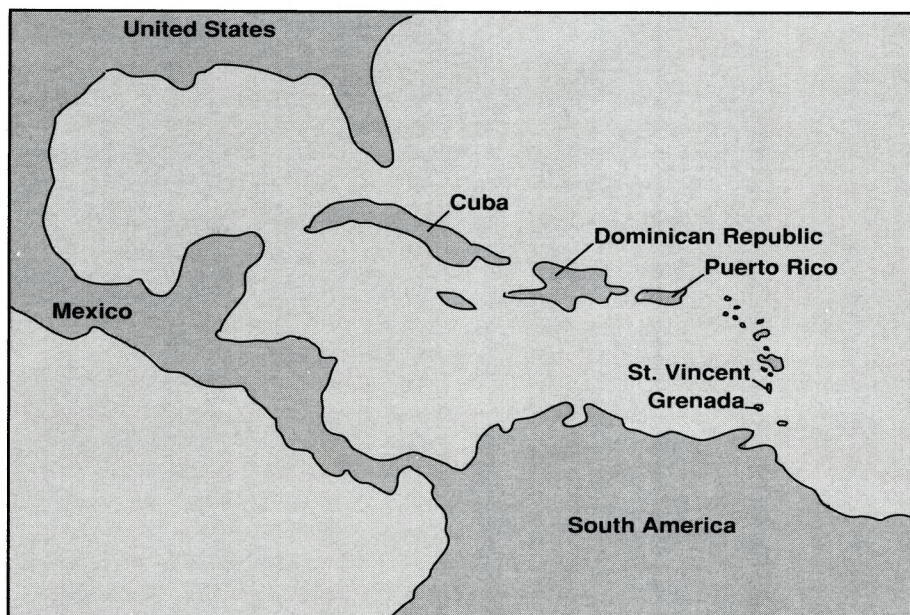
A little farther on is Gingerbread Apartments. This small resort offers three comfortably large apartments with harbor views, an upstairs bar and tasty restaurant, a fresh bakery, a boutique, Sunsports dive and windsurf operation and a tennis court. Sunsports dive operation offers an impressive array of services, equipment and dive locations. Trips are run by an expert instructor/guide from their own dock and on a swift boat.

Next to the Gingerbread, boats are crafted by people with years of experience, a steady hand and a sure eye. Frames, stringers, and bulkheads are hand hewn to a true fit. Boat building was a principle form of commerce for many years, as was whaling.

The world whaling industry is not currently enjoying high popularity. Bequia is, however, one of three sites approved by the International Whaling Commission for two "aboriginal sustenance kills" per year. A single man in a small hand-hewn boat throws the harpoon. The line is wrapped around the sampson post and a thrashing ride ensues. Without condoning the taking of one of these beautiful creatures, one can appreciate the spirit of tradition and adventure and perhaps be awed by the fearlessness of the hunters.

Continuing on the trail, one will see, or more likely whiff the aroma of, Mac's Pizzeria. Mac's is recommended for at least one evening of casual dining, offering many delectable dishes in addition to excellent pizza.

A few boutiques, shops, and an eatery



later is the Plantation House. It's seaside garden resort offering cabanas, poolside bar, a popular restaurant and Dive Bequia. Dive Bequia is not your run-of-the-mill dive operation. Owner-operator Bob Sachs runs a truly professional, full-service NAUI dive facility. His dive staff is comprised entirely of instructors, and typically one instructor accompanies every four divers. Fast, reliable dive boats, top-notch, well-

maintained equipment, and a private dock, together with Bob's world-class experience and skill serve to further enhance this impressive operation's service.

The trail becomes less apparent after the Plantation House. A closer look at the bushes at the base of the hill, however, reveals a footpath snaking its way up and over the crest. Descending the opposite side, peering through lush tropical vegeta-

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Travel Facts

Location	Situated in the West Indies, between St. Lucia and Grenada, 100 miles due west of Barbados, Bequia (pronounced beck-way), belongs to the state of St. Vincent and the Grenadines. Lying nine miles south of St. Vincent, Bequia, at nine square miles, is the largest island in the Grenadine chain and has a population of about 5,000.
Entry	A passport or birth certificate are required for all U.S. and Canadian citizens.
Currency	The Eastern Caribbean (EC) dollar.
Time Zone	Bequia is in the Atlantic Standard Time Zone (Eastern Standard plus one hour). Noon in California is four p.m. in Bequia.
Climate	Bequia has two seasons, dry and wet. The dry season (February - June) is mostly weeks of sunshine and an occasional afternoon shower. The wet season, while still sunny, brings more frequent showers. The northeast trade winds provide a steady breeze which keeps the island temperature around 78-85 degrees Fahrenheit year round.
Clothing	Informal dress. At least a shirt and a pair of shorts or skirt. Bathing suits and bikinis are limited to the beach.
Film	Difficult to find and expensive. Bring plenty. E-6 processing is not available in Bequia.
Pests	There are mosquitoes in paradise. Bring the insect repellent!

tion, Princess Margaret Beach slips tantalizingly into view. Pearly white sand separates verdant and profuse jungle from the turquoise crystal lapping at the shore. While this beach is surely no secret, visitors during the summer months are likely to be able to fulfill any desire for privacy. Likewise, those with an inclination toward crowded beaches, high intensity night life, and congested diving may be disappointed.

DIVING

Diving in Bequia is outstanding. Most dive sites are within ten minutes from the dock. The few found farther are well worth the extra minutes.

After years of countless excursions with an almost ceaseless flow of tourist divers, sites can become stale, replete with broken coral and reef formations, and a paucity of life forms. This is not the case in Bequia. The dive sites are fresh and teaming. Reef life effervesces. Shrimp, tube-worms and anemones compete for space with colorful sponges and coral formations.

Even under the most rigorous scrutiny, Bequia shines. Clear water, imposing walls, soft corals, and other expected Caribbean accoutrements are in good supply. The water temperature hovers near 82 degrees with visibility generally about 90 feet. Decisions about wearing or not wearing warm water wet suit may be resolved by preference or the intended activity rather than concern of becoming cold. For protection from occasional scrapes, divers using photographic or video equipment often wear wet suits, while others frequently do not.

A typical morning dive begins by rising to an already sunny day. A tasty and leisurely breakfast at the Gingerbread are enjoyed while contemplating the blend of colorful sailboats on the glassy morning harbor waters. Breakfast is followed by the walk downstairs to the pier where Sunsport's dive boat is loaded with dive equipment waiting.

The Southwesterly tip of the island is reached after less than ten minutes on the swift, smooth boat ride. The site known as West Cay Wall, was formed by a protrusion

of rock jutting out into the Caribbean. Circling to the outside it becomes apparent that the protrusion is actually comprised of two preponderant rock formations, the outer one being considerably more imposing. A small channel runs between them. The boat is carefully anchored upwind on the seaward side of the channel as you finish gearing up for the dive.

Shortly thereafter, our party of two couples and one instructor/guide dropped twenty five feet into crystal clarity. Colorful sea fans and feathery hydroids wave up from below. A gentle current slips from the channel and moving into it requires a slightly faster kick as the water becomes shallower. Quite suddenly the current changed and whisked us out over the edge of a sheer vertical wall.

Descending slowly we noticed the wall teaming with life, covered with sponges and coral formations of multiple colors. The wall isn't the only thing "teaming". Copious varieties of colorful fish are engulfed by a dense cloud of schooling barracudas. The reflection of sunlight off the silvery sides of swarming jacks is almost disorienting. Dropping through the cloud into clear water again our group nears the one hundred foot level. Boulders the size of small houses line up to form a canyon between the wall and the bottom. Turning slowly left, with the gentle current, exploration of the canyon begins.

In the distance, where the visibility drops off into deep dark blue, a white tip reef shark is seen cruising far out to the right. While passing the first of the large boulders, four 3-foot midnight parrotfish issue from a small cavern below. The striking double blue of the parrotfish make them easily identifiable. Their color is largely a deep navy with light royal blue splotches forward of the pectoral fins. Under the documenting eye of the video camera, they slowly turn and cavort, as if playing with each other. Too soon the parrotfish meander off along the wall in another direction.

Returning to the group, we found one diver carefully examining the dental anatomy of a formidable moray with her Nikonos. Farther down the wall a giant spiny lobster shielded safely within a crack, probes suspiciously with protracted antenna for any sign of irregularity.

DIVE TRAVEL

Along the base of the wall there are undercuts forming small caves, or canyons, working their way in behind large sections of split off rock. This dive, like so many in Bequia, resembles a continuous, but connected, chain of distractions by a startling variety of life forms and geologic formations. From the left, a pair of brightly colored queen angelfish swam carelessly by. The dive is exceptionally effortless as a slow, easily manageable current moves us along in the desired direction. Sunspots dive boat reliably follows our bubbles on the surface.

Here and there damsel fish dart about. Occasionally, the extraordinarily long dorsal fin of young spotted drum fish can be seen trailing back and forth as they swirl about. Slowly ascending, the wall continues to fascinate us. With a sense of reluctance that the dive must end, the group convenes for a safety stop ten feet from the surface. Once on the boat, we head back to Sunspots and the Gingerbread for lunch and some sun.

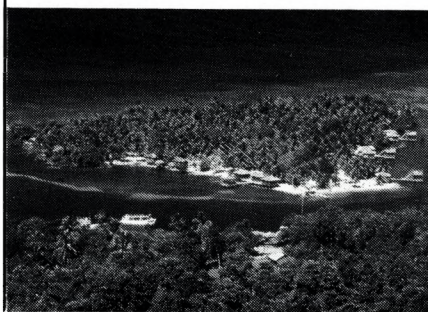
Perhaps an afternoon dive trip to Moon Hole, Boulders, Pigeon Island or one of the many other nearby, pristine spots is in store. Windsurfing under the expert instruction of the enigmatic "Batman" is another option for the afternoon. So many places on the island to explore, so much to do, such becomes routine of vacationing in Bequia.

The inevitable, unavoidable reality of leaving this adventurous and relaxing sanctuary was nonetheless disturbing. Ways to return immediately and stay forever became a more and more frequent topic as the departure date approached. Quit work, sell everything, move to Bequia, perhaps start a dive operation were some of our thoughts. On second thought, trying to compete with top notch operations like Dive Bequia and Sunspot would likely result in starvation.

The following Monday morning, while rushing back into the fast pace of big city living, recollections of Bequia and planning to return soon made the day a little brighter.

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...about Abridged Dive Tables

by Eric Hanauer

My open water students were aboard a charter boat at Catalina Island for their final day of diving. One of their assignments was to track their progress on the tables, and to check their plans with the divemasters before entering the water. On the third dive of the day, several of them appeared apprehensive.

"We can't make the third dive," they said.

"Why not?", I asked.

"The tables won't allow us any bottom time below 40 feet."

The first two dives had been multi-level excursions to 60 and 50 feet maximums, for no more than 30 minutes with over an hour of surface interval between each dive. This was safe, conservative diving. On my computer, all the pixels were above the 30 foot mark, and a wealth of unused bottom time remained at nearly all depths. But when checking out their calculations, I was astonished to find that they were virtually out of bottom time at any depth beyond 40 feet. The problem was that they were using the new DYVE (you may substitute the name of your favorite instructional agency) tables, which had been abridged to be so conservative that they severely restricted bottom time on repetitive dives. According to these tables, the students should have made their third dive in the boat's galley, watching cartoons on the VCR.

It doesn't matter which agency I'm referring to; all of them have produced abridged tables which are far more conservative than the U.S. Navy Tables on which they are based. The agencies are caught in a classic squeeze. The scenario goes something like this: Diver Don gets bent using (or abusing) the original DYVE tables. These were based on the Navy tables, except that bottom times below 130 or 140 feet were eliminated, since 130 is the mandated limit for sport divers.

Diver Don hires a lawyer, who files suit against the instructor that taught Don five years ago, the shop that hired the instructor, the dive boat, the manufacturer of his watch, regulator, fins, and wet suit, and against DYVE, the agency that produced the tables. The lawyer will trot out expert witnesses who will explain to the jury that computers based on no-bubble tables allow less bottom time than DYVE's, and that current research on decompression is inconclusive. The lawyer will rant and rave about how unsafe the Navy tables are. Don will look pitiful in his wheelchair, arousing the jury's sympathy. In an attempt to cut their losses, the agency's insurance company settles out of court.

The insurance company then raises DYVE's rates, and threatens to drop them if they lose any more court cases. The agency's executive board decides that in order to avoid any more judgements, their tables must be made more conservative. So they chop five minutes off the bottom time at each depth. Their competitors, DADI, WOWI, SISI, and NASDI, will have to follow suit, otherwise lawsuits will follow them as well. Suddenly the Navy tables, which safely supported 80 years of diving, are considered obsolete and dangerous by the gurus of the sport diving community.

We now have two distinct classes of divers: table divers and computer divers. Because of the multi-level profiles allowed, computer divers get more total bottom time on the kinds of dives that sport divers usually make.

This "bottom time envy" leads to all sorts of unsafe practices. Buddies may share one computer, or even worse, other divers who were near the same depth and time will hitchhike on information from someone else's computer. That's like using the results of someone else's blood test merely because the sample was taken on the same day.

The new agency tables exacerbate this situation. Now, the gap between computer users and table divers has developed into a gaping chasm, like that between the rich and the poor in a third world society. Computer users enjoy a wealth of bottom time, while underprivileged table users sit out the third dive of the day. Once divers realize the differences between tables, they treat them like motorists treat the 55 mph speed limit. They no longer trust the tables, they modify them with off-the-cuff extrapolations, and may eventually get bent.

In a perfect world, everyone would dive computers. Eventually the dive computer will become a mandatory piece of gear, like

How Computer Tables Work

Computers are programmed to minimize silent bubbles (nitrogen bubbles in the bloodstream that are too small to cause symptoms, but can be detected by a Doppler ultrasonic bubble detector), therefore reducing maximum times at each depth from those of the Navy tables. For example, the Navy allows 60 minutes at 60 feet. Most computers allow only about 50 minutes at that depth. In actual practice, however, computer users usually get far more bottom time. This is because sport divers seldom spend the entire dive at maximum depth; they go up and down (multi-level diving), and are given outgassing credit for all the time spent at less than maximum depth. Therefore that 50-minute limit can virtually double, if a large percentage of that time is spent in shallower waters. If the entire dive is spent at maximum depth however (square profile diving), this advantage disappears.

submersible pressure gauges or octopus regulators. Until then, we will continue to have table divers, and public confidence in tables has never been lower.

The U.S. Navy tables used to be considered the underwater equivalent of the stone tablets that Moses brought down from Mount Sinai. Literally millions of dives, in sport, professional, and military sectors, have been made on them, with an excellent record of safety. Based on research done by John Scott Haldane in 1908, they had been modified over the years to fit experience in the field. Whenever a certain combination of depths and bottom times produced bends, that section of the tables was changed. If Haldane was to return today, he probably wouldn't recognize his own tables.

When computers came along, it became necessary to further modify Haldane's tables to compensate for the extra bottom time allowed though multi-level calculations. These modifications were calculated mathematically to minimize silent bubbles, then tested on a small sample of volunteer human subjects. Not everybody is comfortable with the resulting computer algorithms because they are still a patchwork quilt, no longer completely fitting Haldane's or anyone else's theory. Advocates of bubble mechanics theory are developing a promising new set of tables and algorithms, which would be consistent with theory across the board (See "Things...", *Discover Diving*, November/December 1990). But until these are tested and released, Haldanean tables are still the best we've got.

Decompression has been the hottest diving research topic of the past decade. Yet with all the studies that have been made, no one has developed a table on which everyone agrees. According to UCLA's Glen Egstrom, there are at least 17 different dive tables in use today. All are safe if used properly, but some are safer than others. The price of safety is reduced bottom time.

A few principles are commonly accepted. Any dive close to the limits will produce asymptomatic bubbles, detectable by a Doppler meter. These bubbles usually disappear if the diver makes a short stop before surfacing, at a depth anywhere from 10 to 30 feet. A slightly deeper stop is less affected by surge and choppy surface conditions, and research shows that bubbles are eliminated more effectively deeper than previously thought. Therefore AAUS (American Academy of

Underwater Sciences), the group that oversees scientific and technical diving, now recommends a 5-minute stop at 15 to 25 feet before surfacing, when diving near the limits. Some sport diving instructional agencies have included this recommendation in their tables. In addition to the obvious outgassing benefits, it forces divers to save air for the stop, and also to control ascent rates. Egstrom considers the safety stop "...the cheapest insurance we've got..."

Most sport dives are multi-level, but calculating actual multi-level profiles without a computer is beyond the ability of most sport divers. Keeping track of depths and bottom times would require so much attention that little else could be accomplished. Computers recalculate decompression status every few seconds throughout the dive.

A sport diver doing multi-level diving, but following the standard Navy table practice of charging himself with maximum depth and total bottom time, has a lot of slack built into his dive because of all the time not spent at maximum depth. The Navy tables, used in this manner, are extremely conservative and safe. This important factor has not been adequately addressed in the abridged tables. When adding a safety decompression stop to the calculation, this procedure becomes even more conservative.

On square profile dives, however, the slack disappears and additional safety factors need to be built in. No-bubble limits can provide these factors. But why hold all table divers to these abbreviated limits for the few who do square profiles? A more logical approach would be to give them all the data, educate them about the risk factors, and let them make a choice.

A bend-proof table may not be possible. Even the most conservative of today's tables will result in a one percent risk of bends. No one knows the exact figures on the Navy table's risk, but it is estimated at three to four percent (most of it on deep, square profile, or multi-day diving). This is acceptable for the

Two (almost) Unabridged Tables

Although unabridged Navy tables are becoming an endangered species, two sets of tables currently on the market still display the Navy limits: the Nu-Way and the SSI tables.

Originally published in 1971, Ralph Maruscak's Nu-Way Table was the first to flop table 2 (surface interval credit table) and draw arrows to make the Navy tables easier to follow. All the subsequent agency tables are based on this format. On the reverse side are the full Navy tables, all the way to 190 feet. The only unabridged Navy table still available, this has become hard to find at many dive stores because of liability anxiety.

SSI's (Scuba Schools International's) new table shows both the Doppler (no bubble) limits and the Navy limits, down to 140 feet. Doppler limits are recommended, but the others are also included and color coded. The diver is given the option of which ones to use. On deep dives, square profile dives, or on multi-day trips, a diver can use the Doppler limits. On single day, shallower diving, the Navy limits may be utilized.

Navy because they have chambers standing by on all diving operations. Contrary to rumor, they have no current plans to modify their tables.

It's a given that tables are in a state of flux today, and tomorrow's research might eventually prove that the Navy tables are unsafe. Ultimately, everybody should dive computers. But neither has happened yet, and until it does, let's not throw away the Navy tables for the abortive versions now on the market. To quote a popular corollary of Murphy's Law, "If it ain't broke, don't fix it."

It's time for the agencies to show some leadership instead of caving in to the lawyers and the insurance companies. Teach divers how to make decisions regarding ascent rates, safety stops, and repetitive dives, and give them credit for the intelligence to make the right ones. Don't just arbitrarily chop their bottom time, and pander to the lowest common denominator of divers.

Here's my suggestion: Leave multi-level calculations to computer divers. If you do square-profile diving, use the no-bubble tables. Give multi-level table divers a model that works: the Navy tables. Require safety stops, especially on multi-day trips. Make the deepest dive of the day first, do the deepest part of each dive first and move shallower, and don't push the limits. Be careful on the deeper categories, and especially on the third dive of the day after the first two have been deep. But don't just trash something that has 80 years of safety going for it before you can offer a substitute that's really better.

MARTY SNYDERMAN

Wildlife Photographer

By Michael Menduno

Introduction by Mark Conlin

It is hard to believe someone as talented and prolific as Marty Snyderman lived in San Diego for a year with only two possessions, hangers in his closet and a mattress on his floor.

When he left Tennessee to come to San Diego all he knew was he wanted to do something with sharks. What that "something" was was up for debate. His parents thought a Vanderbilt education would lead to, well you know, "professional" work. Marty had other ideas.

His early years as manager of the San Diego Diving Locker were an education. Owned by Chuck Nicklin, this was a mecca for underwater photography. Lean time meant scrimping and saving for that first piece of camera gear of any kind, an underwater strobe.

To make his mark, Marty knew he needed to get dramatic shots, not just pretty pictures. This was just about the time the movie *Jaws* hit the screen. So Marty, Larry Cochrane and Howard Hall decided to build a shark cage. A couple of careers were built on these early, open-ocean dives. People now wanted to buy his shots rather than just admire them, and blue shark footage that Marty and Howard shot ended up in a Stan Waterman prime time shark show. The ball was rolling.

Being one of the first to experiment with open-ocean shark diving, I asked Marty if he was scared. He laughed and said, "raising \$10,000 to buy a film camera and not knowing if anybody was going to hire you, now that was scary."

The question Marty frequently gets is "what does it take?" The answer is not an easy one. Being comfortable in the water and knowing how to behave around animals is a prerequisite. But more important, having the determination to keep getting wet, or, as Marty likes to say, "not being smart enough to get discouraged". A competitive nature doesn't hurt either. He loves this profession since, "you make your own decisions and are limited only by how hard you work."



Marty considers himself a spokesperson for nature. "When I look at my pictures I see the technical flaws. But when I look at nature, I see perfection." We need more spokespeople like Marty.

Discover Diving: *Though you've become known as a marine wildlife photographer, it was shark photography that really helped launch your career. What are the real skills behind shark photography, in your mind? What does it take?*

Snyderman: I think the most underrated skill of an underwater photographer—or maybe under "realized" skill—is having a feel for the animals and being able to work with them, particularly sharks. And that comes from

being in the water with them. Being close to them. Knowing how to get close to them. Knowing what behavior is going on and what makes it interesting. People still call me about taking pictures of resorts, but I'm more interested in marine life. And for me, the name of the game is behavior. That's what's fascinating, what makes an animal species unique and that's the material of mine that sells.

Discover Diving: *You've probably spent more time in the water with sharks than all but maybe a handful of people — what have you learned about their behavior in your work?*

Snyderman: There are some generalizations that can be drawn, but there are 350 different species of sharks and their behavior varies not only species to species, which it certainly does, but at specific times of year, location, and what's happening in the ocean. It's as simple as one day you can make blue sharks come to bait and the next day it's frustrating. Some days you can get 'em around you and you can't make 'em eat; and some days you can't keep 'em off of you. It's that way with every species I've ever worked with. In locations, people who are new to the marine environment often think that sharks are totally unpredictable. There's a lot of predictability to them, but that can change too and you can get outside the parameters at any time.

Discover Diving: *It's a learning experience.*

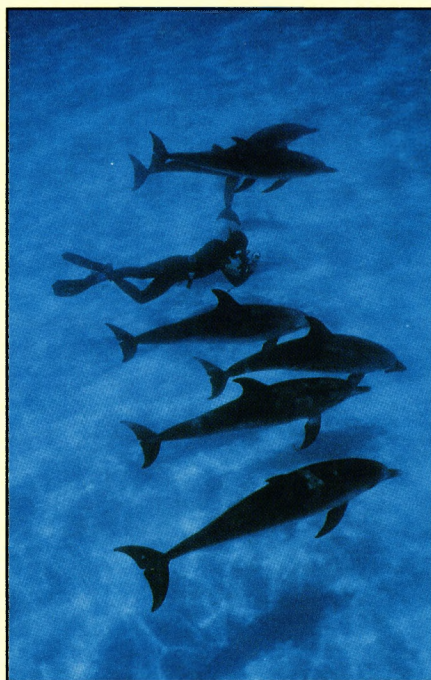
Snyderman: Exactly. One of the problems that any underwater photographer has is, these animals are wary of something about

“...the most underrated skill of an underwater photographer—or maybe under “realized” skill—is having a feel for the animals and being able to work with them...”

their size that blows bubbles, that wears all this stuff, that has this boat and a generator running, and whatever. Unless you put bait in the water, you can't get close to 'em except on very rare occasions, usually for very brief moments. People occasionally look up and see blue sharks swimming overhead, but you don't go up to a blue shark and swim next to it for twenty minutes. The shark splits. When you introduce bait into the water, the game changes. And that is the mode that people typically see sharks on film or in still photographs, and it's not the way the animals are all the time.

Over the years, because I've been able to be involved in so many projects, I've been able to witness natural predation on a number of occasions. One of them was with blue sharks feeding on squid. You learn some rather remarkable things. It's interesting to me that these sharks literally swim into the squid; they eat 'til their bellies are totally distended and squid are literally hanging out of these animals' mouths and they start to throw up. When they've made a little space, they start to eat again. Of course, the human reaction is; it's obnoxious. It's gross. And it doesn't seem very biologically efficient. It's bugged me for years that nature would make an animal that would do that. You think, what a waste of energy. And if there's anything that animals do well, it's conserve energy when food is limited.

Well, since then I've learned that what really happens is that squid have very soft body parts which are high in protein and nutrition, as well as tougher body parts. Over the years, sharks have figured out how to throw up the



tougher parts to make room for more of the softer body tissues. You learn these kinds of things a piece at a time. Or you can go days without learning anything at all and then... One of the most remarkable experiences of my life occurred a couple of summers ago when krill showed up off the coast of San Diego, and along with them, blue whales. But when we went out there to film the whales, there were literally, and I mean literally, thousands of blue sharks around. As soon as we jumped in the water, the sharks rushed right at us in big numbers. I'd never seen blue sharks exhibit that kind of aggressive behavior. We were kicking and hitting them off constantly. Now I've seen them when we put bait in the water. But this was something different. They were

so jacked up eating krill. They'd get real, real excited and then subside. And get real excited, and subside. We watched 'em feed on krill and I watched them hit the live mackerel that were out there feeding too, though on other occasions I've seen 'em miss dead mackerel bait over and over. The point is, live animals give them a different stimulus that works with their sensory capabilities better than a floating, frozen mackerel. To learn about those subtleties you have to be out there a lot and you have to be a little bit of a schooled observer, if you will. A lot of that just comes from spending your time out there, all the time. It doesn't just happen on Tuesday afternoon because your budget's limited.

Discover Diving: *Are you ever afraid out there?*

Snyderman: Yeah, I think there's no question that you're always trying to pay attention. I don't think it's all that dangerous or I wouldn't do it. There's a lot of facets in my life that I enjoy. I enjoy playing racquetball... there's a ton of stuff I enjoy doing. And I don't want to put myself in a situation where I'm going to have serious injuries in my life and not be able to enjoy the other things there are to enjoy. Yeah, I've been scared, but it's been a long, long time since I have been. One of the times was with Howard Hall filming blue sharks and squid. The squid were placed in around Howard's movie light so densely that we were engulfed in squid. I was literally touching Howard and we couldn't see each other. There were sharks in there eating, slamming us. I was supposed to be Howard's

safety guy. I not only didn't know where the sharks were, I didn't know where Howard was. We couldn't see each other in the squid and we didn't even have the three or four seconds to find each other, literally, to find each other's faces and hands, and abort the dive. Was I scared? Yeah. It was a situation that got beyond anything that I thought I could control.

It's funny though, my biggest fear has not been of getting bitten. It's been being a safety diver and lettin' the other guy down. That's the little thing that plays the most mental havoc with me and keeps me awake. But it's been a long, long time since I've allowed myself to get into a situation like that.

Discover Diving: *I know a lot of people have been outside of the cage with blues, even maybe an occasional mako, but I understand that you've filmed great whites from outside of a cage. What were the circumstances?*

Snyderman: The first thing you should understand is when you're outside of a cage with a blue shark, you can't put a gate around it, you're out there with every shark in the ocean. When mako sharks show up, they do not ask if they can come to the party. When you're outside, you're outside and you're out there with everybody. On a couple of occasions, we feel like we've seen great white sharks when we were out there filming blue sharks. So, you're out there with the world.

The first time I was outside of a cage with a great white shark was down at Guadalupe Island with Howard Hall and Tom Allen shooting a film for Wild Kingdom. It was something like our fourth day of chumming. The first shark came in and we watched it swim around the boat for awhile. We put bait in the water in front of it, it bumped the bait but didn't take the bait, and I remember standing on the boat saying, "Howard, I know this sounds stupid, but I think we could get out and work with that animal like we have any number of sharks. Am I bein' crazy?" He said, "No, you're not. It's exactly what was goin' through my head right now."

I'm not saying you could do it with every white shark all the time, but it did appear to us we could do it that time. It was a matter of judgment.

Discover Diving: *It sounds like you rely a lot on feelings, your feeling of the situation and your instincts, if you will.*

Snyderman: Yeah, that's all you've got to go on. You can't read it in a book. I'd like to think I won't be so arrogant to just rely on my feelings. I mean, when you have a resource like Howard Hall on the boat, you ask him, you drill him for information. The guy has an extra couple of senses. One of the things you should know is that I think I'm really good at my job; but I think Howard's going to the Hall of Fame. Put it in print: I mean the guy has really got it together when it comes to dealing with animals. And so does Tom Allen. They've been a wonderful source as teachers. We've shared our thoughts about techniques for years. Both of them were quite willing to share.

Discover Diving: *So you got in the water without the cage?*

Snyderman: Hell, people have been bitten outside the cage with white sharks — some of them got bitten and some of 'em just saw 'em and then they went on. But it really gave us an opportunity to get some photographs that people had never gotten before. That's exciting when you're in the photograph selling business. But there's something else. If you think you know something and it's really a part of your life, you want to know that you know it. Do you just think you know, or do you really know it? I felt like we could get outside the cage and there was only one way to find out. Eventually, Chip Matheson, Bob Johnson, Tom Allen, Howard and I were able to work on three to five occasions from outside of the cage. On one occasion we had a number of white sharks around. It's not something I want to do every day of my life. I don't want to make that kind of judgment all the time. I know when you're on the edge like that, of any endeavor, there's a canyon on the other side, you do it enough times and...hey, I'm just a human being and one day I'll make a mistake... but, on the other hand, I didn't think it was that day. You know, I felt pretty confident and comfortable.

Discover Diving: *You felt you could do it and you had a reason.*

Snyderman: That's right. There was a real benefit in being able to get outside of the cage and be that much closer to getting a photograph that really was a knock-out punch. And I got some really spectacular images. They're kind of near and dear to me. I've learned to think of my photographs as inven-

tory of my business. But I also got a couple of moments out there that were near and dear; those white shark moments. They were an ultimate experience in the water. I'm not saying the ultimate. If I tried to compare them to a whale shark or a blue whale or killer whale — I wouldn't even know how to make the rules for the contest — but they were an ultimate experience and I value them a lot.

Discover Diving: *I know you've spent a lot of time in the water with whales as well. How do they compare to your shark experiences?*

Snyderman: Well, first of all, whales are a lot harder to approach than sharks. Bait makes all the difference in the world, and you don't carry whale bait. The game with whales is to pursue, or to hopefully find, one that's curious. Right whales and the spotted dolphins off the Bahamas are of the few whale and dolphin species that I know that really come to people. Despite their enormous size, most of them are very wary of divers. Whales are frustrating. It is interesting to note that in the first whale film I ever worked on, Howard Hall got hit by a gray whale which broke his left arm and two ribs. In the scene, I was supposed to be between Howard and the whale and thank God, I didn't do it. We were working with horrible visibility underwater. Talk about dangerous. Just think about being in the water with an animal weighing 100,000 pounds in shallow, murky water. Give me white sharks any time. They're something I can see and something I can deal with. Whales scare me a lot worse than sharks do. That may not be true of other people, but that's been my experience. I just got through last fall with one of the most magical experiences of my life, filming southern right whales in Argentina. A lot of it happened in 15-25 degree F and eight feet of water. There was no place to go. At times the whales swam directly over us; at times the whales settled on the bottom. And you know it's not like you're in 3,000 feet of water that you can just go down and get out of the way. That is intimidating.

Discover Diving: *I'll bet!*

Snyderman: ...Once the whales settled down around us a little bit, it became pretty easy. I got smacked by the tail of a whale really hard in the first few minutes of our first dive. And then I got hit a couple minutes later —

nobody saw me so I think nobody really quite believed that I got hit that hard — there's a lot of excitement; it's easy to say you got hit or brushed, or whatever. Well, I'd gotten smacked and I got smacked again later by a calf that went right over me and I never saw it. I was filming the mom and the calf smacked me with its tail right in the back — kinda bowled me over a little bit — and after that I was never the one that got hit. But Howard got smacked pretty badly one time and Bob Cranston got smacked, but that was after days of diving. I don't think any of it was all that malicious; it's just a little pat on the ass. A pat on the back from a whale is a different pat than I want. At least you're not worried you're gonna get eaten when you're out there with a whale. I guess with a shark you're always thinking, don't let the animal turn on me. With whales you're thinking, just don't run into me, or let me get between them. Bob Cranston came real close to that in Argentina. We were all kinda scrambling, pushing ourselves out of the way. They're just so big.

Discover Diving: *You know Marty, there are probably a lot of people who view you and Howard as crazies, taking the chances you do. Do you view yourself as a risk taker?*

Snyderman: I do whatever it is that I need to do to get the image with the qualification that I won't do anything unless I feel comfortable or safe in doing it. I'm not about to tell you that any image in my library, or my entire library, is worth every other thing I do in life. I want to live a real long, normal — well, semi-normal — healthy, active life. And if I don't think I'm gonna threaten those things during a dive being made and that there's a margin for error, I'm going to make it. Something that has always struck me as strange is Howard and I got started in this business with a little public recognition. One of the prices you pay is that people would come up to us and say, "You guys are those daredevils. I know you guys'll do anything in the water." The fact is that Howard Hall is one of the most analytical people I've ever been around in my life. He can look at the situation and break it down into component parts really, really well. He can analyze wind vs. current vs. drift vs. the psychological fear vs. reality. He taught me a lot about that. I always thought I could do those things before I met Howard. The fact is, I think we try to analyze as many aspects of a situation

and work with the realities. There are some people that see a shark and think, "Jesus, there are sharks out there and you guys are jumpin' in the water"; what a bunch of idiots. Well, we built cages; we looked at it for a long time; we got two feet from the cage with one blue shark while the other guy watched on the horizon for anything else that might come; we did it for hours; we did it for years. When we jump in the water, there's a lot of experience. We see things a little differently. It's kind of a step at a time and analyzing it all and talking about it. And it's not just a matter of having the boat, the bait, those guys did it — let's get out of the cage; if they can do it, anybody can do it. I think if we can do it, anybody can do it, BUT they'll need to be real analytical. There's a big price to pay if you're wrong.

Discover Diving: *So what keeps you going?*

Snyderman: That's easy. I haven't seen it all. Then once you have, somebody's gotta be out there bein' spokesperson for it. I'm not sayin' that I can do that—certainly I can't do that by myself. I can throw in my two cents worth. I'd like to try. It may sound a little corny, but I love the marine environment. I love wildlife. I love the habitat, and the part of my personality I have to be careful of is that I like all those things a lot more than I like people. I'm not sure I want to put all those things in print, but it bothers me that there are five billion people out there and we're a threat to almost every species on this planet. I feel strongly about it, but I'm not very likely to get at the corner of Grand Avenue and Jewell Street and preach to people about it. I just think you've got to contribute in the ways you can.

Discover Diving: *What's the future for Marty Snyderman?*

Snyderman: There's so much happening in my business. I don't know. The thought of retiring—I mean, I'm only 41—the thought of retiring has absolutely no appeal to me, but I would like to get into fewer, bigger projects. It's fascinating that... here's what I think it is: it's not so important that all the things I'm doing underwater get done. What's important is that somebody has the perspective that this business has given me. A lot of people are running around all day selling insurance or whatever they have to do to make their life work here in America. I don't want to do that.

I have friends who do and I like them. I respect them. But if ya live that lifestyle, there's no way you can see the things I see, or think the things I think after having spent literally thousands of hours underwater, talking to the mix of people I talk to, getting the mix of information I'm privy to. It's given me a different perspective on life. I'm not sayin' my perspective is the only one to have or that it's right. But it's valuable. When society makes decisions, I think that the perspective that I've gained through my lifestyle ought to go into the mixing pot to say, "Here's how we make responsible decisions." This is my expertise in life and I'd like to pursue it as best I can so that my interests—I don't want to say "my" like it's mine—so that environmental interests, the naturalists point of view is represented. I don't think it's the only right answer; but it's part of the answer and I think it's very important that it be considered. I want people to consider this perspective in their decisions and that's the contribution I want to keep making. That's what I think's in store for me. It's idealistic, I know. I've often had problems with that. I am...[takes a deep breath]... I am a little bit idealistic. I try to be real hardcore in any given minute and look at the reality of situations, but I suppose that if one just looks at reality all the time, you get a bit of a dark picture. I'm not so naive to think that we're going to win every battle and I'm not sure we're going to win the big one. If that's the case, all I can do is the very best I can do and try to make the very best contribution I can make. Then there are just factors that are beyond my control. You do what you can.

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Mark Conlin works as a cameraman and producer for Howard Hall Productions in San Diego, California. His still photos and background in marine biology have been combined to produce recent articles for International Wildlife and other publications.

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DISCOVER DIVING

Today!

EXPLORING AUSTRALIA'S WONDERS DOWN UNDER

PART 1 THE GREAT BARRIER REEF

Text and photography by Edward Weber

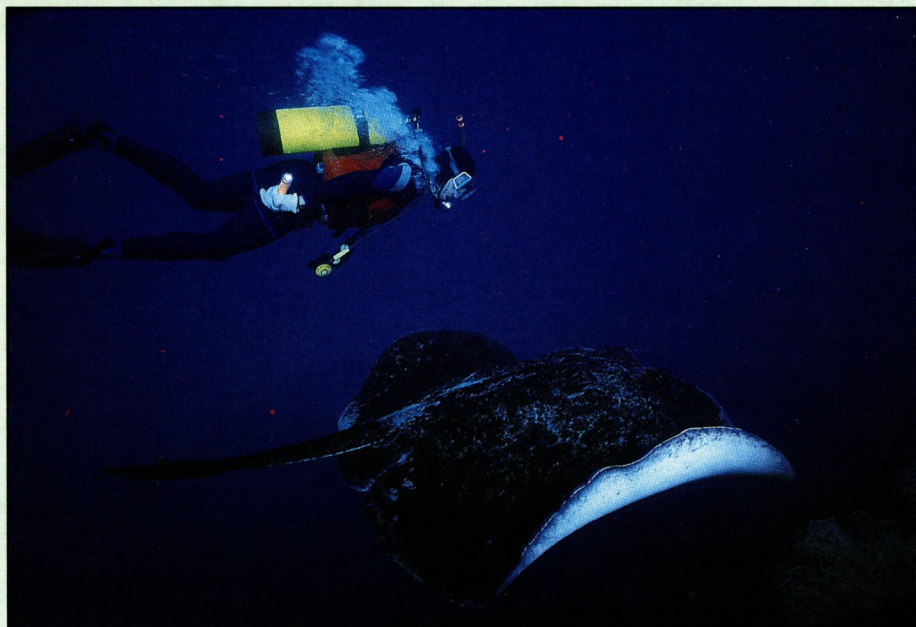


*A lionfish hides beneath a coral overhang at **Pixie Pinnacle**.*



An Australian favorite – a koala bear!

I saw the first sign of the approaching Australian coastline out my window of an Air New Zealand 747: a string of white pearls stretching across a shimmering turquoise parchment. Ringed in bands of aquamarine and fading in ever-darkening hues to cobalt, the sighting of these sand cays was my first proof to the greatest living wonder on the planet, the Great Barrier Reef. The sight got my blood going as this is why I had come. As with almost every other diver in the world, the Great Barrier Reef had been at the top of my “must dive” list almost from my very first underwater exhalation.



Above: Diver and bat ray swim along the top of the **Yongala**.
Above left: Maori wrasse at **Cod Hole**.
Right: Diver above the **Wreck of the Yongala**.
Below: Mating nudibranchs at **Pixie Pinnacle**.



AUSTRALIAN TRAVEL TIPS

All visitors require a visa and passport to enter Australia. Visas usually allow a stay of up to six months.

Australia uses a monetary system similar to the U.S. in dollars and cents. It is a good idea to exchange some money (for food, baggage carts, taxi's etc.) before arriving in Australia. Traveler's checks can be easily cashed at major hotels and credit cards are widely accepted.

The electrical supply in Australia is 240 volts and 50 cycle current. Most charterboats are equipped with 110 volt charging systems, however, it is a good idea to bring a converter.

Bring plenty of film as even though film is readily available, it is VERY expensive in Australia.

Even though Queensland is in the tropical north, it is a good idea to bring along an extra sweatshirt or sweater and long pair of pants as it can get cool in the evening, especially when out on the reef.

Australia is famous for its unique wildlife and many gameparks, billabongs and sanctuaries featuring Australian wildlife.

The gorges in the rainforests north of Cairns also offer some good after dive excursions with excellent hiking trails along spectacular mountain rivers. Many excellent swimming holes can be found, as well as great picnicking areas.

Finally, after crossing the reef and making a few well-executed maneuvers to avoid the jungle-sheathed mountains of the Great Dividing Range which fringe the Australian coast, our pilot settled the big bird onto the tarmac at Cairns International Airport in northern Queensland. I gathered my mountain of diving and photo gear from the baggage carousel, cleared customs with a friendly "goo'dye mite" from the official and made my way to town where I checked into the Radisson Hotel on the Cairns Pier.

Cairns is a distinctive tropical city of 80,000 which sits on the edge of Trinity Bay in the northern tropical state of Queensland. It is nestled against some of the last remaining tracts of tropical rainforests on earth that fall out of the tall verdant mountains of the Great Dividing Range. To the west, across fifteen miles of ocean, lies the Great Barrier Reef. Cairns is the closest populated area to the reef making it the logical choice of departure for most day and liveaboard operations diving the reef.

QUEENSLAND

Queensland is a large state encompassing the northeastern section of Australia, divided at midpoint by the Tropic of Capricorn.

The climate is sub-tropical to tropical with the warmest sections in the north. Australia is in the southern hemisphere which reverses the seasons and weather patterns known to residents of the northern hemisphere.

The winter months, for example, fall in July and August when the weather is the driest. The summer months come in January and February and are usually wet. September and October generally are the better months to visit Australia given the calmness of the wind during this period. The weather during these months tends to be fairly dry and sunny almost every day.

Captain James Cook is credited for making the first European discovery of Australia when he explored this area during his initial voyage in 1770. In fact, it was also Capt. Cook who to his misfortune discovered the Great Barrier Reef and inadvertently ran his ship *Endeavour* aground on what is now Endeavour Reef off northern Queensland. Today, most of the 2 1/2 million people of Queensland live along the coast in cities such as Townsville, Cairns, Port Douglas and Brisbane (which is the capital city of Queensland).

THE GREAT BARRIER REEF

Stretching for more than 1,250 miles along the Queensland Coast, the Great Barrier Reef is the largest living structure in the world. The Great Barrier Reef is actually made up of two reef systems - one which hugs the shoreline and another which extends as much as 220 miles into the Pacific and containing more than 2,100 individual reefs. The master engineers of this organic phenomenon are the tiny coral polyps which secrete coral limestone and provide the framework for this 18 million year old reef building project.

Over 300 species of coral make up the architectural structure of the reef, ranging

from brown and purple staghorn to the intricate colors of giant gorgonian sea fans and luxurious soft corals. Over 1,400 species of the most colorful fish on earth inhabit the fabricated color condos of the reef, creating complex marine communities.

There are hundreds of islands scattered along the coral ridges of the Barrier Reef. These islands are made from two separate types of geological foundations: coral cays, the sandy sedimentary coral islands; and over 500 continental islands, originally connected to the mainland and separated during the ice age.

DIVING THE REEF

Visibility along the reef is somewhat dependent on season and location. Along the borders of the mainland and continental islands, visibility tends to be poorer due to estuary run off from the mountains. Here, it can range from 30 to 50 feet. The inner portion of the reef is a bit clearer with visibility in the 60 foot-plus range. The outside of the reef which is exposed to the clear waters of the Coral Sea offers the clearest water with visibility often exceeding 100 feet. Visibility is also better during the winter months of July and August.

Water temperature also varies with season and location. The northern sections of the reef are closer to the equator with warmer water. The water cools during the winter months as well. The average range of water temperature is 70-80° F.

Because of the complex and diverse structure of the Great Barrier Reef, literally hundreds of thousands of excellent diving sites exist along the reef. It would literally take someone a lifetime of full-time exploration to see the reef to its full potential. Consequently, one cannot even begin to hope to see all the Great Barrier Reef has to offer on one, two, or even three trips here. Most of the dive operators however, offer a selection of excellent diving sites that show a good cross-section and diversity of the reef system. Liveaboard trips of two or more days are recommended to get an idea of the diving the northern, mid and southern sections of the reef.

The evening after my arrival, I checked out of my hotel and boarded the *Coralita* for a four day trip into the northern section of the reef. Most of the liveaboards have an evening

departure and make an overnight run to the reef to start with a full day's diving.

The *Coralita* is a 79 foot single-hulled vessel that is operated by Australian underwater photographer Alby Ziebell. The *Coralita* carries a maximum of twelve divers in six staterooms offering an uncrowded and intimate dive vacation.

We awoke the following morning in the lee of picturesque **Lizard Island**, the northernmost resort island on the reef and an Australian National park. A fringing reef encompasses this continental island.

The reefs around Lizard Island are scattered with staghorn and various other hard corals, giant anemones, clams and a host of tropical fish life. Although the marine life is not as prolific as the outside reef, we were satisfied spending the first day diving these fringing reefs as we waited for the wind to die down on the outer reef.

The next day we headed into the Ribbon Reefs along the outside of the barrier reef. The Ribbon group is a series of reefs that extend 80 miles along the northern outer barrier reef. Innumerable dive sites are scattered along this stretch and we spent two days exploring this outer section. Dramatic vertical drop-offs with beautiful coral gardens serve as a backdrop for patrolling pelagic fish that cruise in from the Coral Sea.

An excellent site in this region is **Pixie Pinnacle** which rises from the ocean floor to within a few feet of the surface. A mere hundred feet in diameter, Pixie offers just about everything a diver could hope to see on the barrier reef. Immense purple tipped anemones safeguarding several varieties of commensal clownfish are scattered along the ledges of the bommie (Australian for coral head - ed.). Huge mantis shrimp watched with curiosity from the confines of their shale dens as I photographed mating yellow nudibranchs. They scattered to safety upon having their own picture taken. Thousands of schooling bait fish move along the pinnacle like shimmering windswept clouds streaming across a liquid sky.

Pixie Pinnacle is one of the finest dives I have ever made and one day here was not enough to satisfy my photographic interests. But our time on the northern section of the reef was running short and we steamed north to Comorant Pass to dive the famed Cod Hole.

The **Cod Hole** is an underwater plateau with a predominantly sandy bottom with scattered bommies. The main attraction here are the 15 to 20 massive (and I mean Volkswagen sized) potato cod that hang out on this section of the reef. The divemasters of the charter boats have been hand feeding

these 100-200 pound behemoths for years. They have become quite accustomed to divers over this time. They put on quite a show as they vie for the handouts the divemasters provide.

In addition to the potato cod, several maori wrasses have started to hang out at Cod

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Hole. They try to get into the act by beating out the potato cod for the treats. The result is a hilarious cat-and-mouse game of underwater tag. Our time on the northern reef had reluctantly come to an end and that evening our skipper, Alby, pointed the *Coralita's* bow towards the mainland and we headed back into Cairns.

Another liveaboard which travels to several portions of the Great Barrier Reef and the Northern Coral Sea reefs of Osprey, Bouganville and the Cod Hole is the *TSMV Reef Explorer*. Also departing from Cairns, this 65 foot dive vessel is owned and operated by Allan Payard and Kim Campbell. As a recipient of the "Commonwealth Survey", Australia's highest marine vessel safety rating, the *Reef Explorer* travels to distant world-class oceanic reefs. The water is warm and clear with 200 foot visibility being the norm! The reefs are abundant with soft and hard corals, teeming with exotic sea life, colorful reef fish and exciting pelagic encounters.

With my sojourn in northern Queensland complete, I boarded an Ansett 737 for a short hop to Townsville to try the diving on the mid-barrier reef. There are several charter operations that run out of Townsville. The largest operator is Mike Ball Watersports. The Mike Ball fleet includes three large catamarans for trips ranging from weekenders to

extensive Coral Sea expeditions.

We headed out from Townsville for a four day trip aboard the 90 foot charterboat, *Supersport*. The highlight of the expedition was two days of diving on the famous **wreck of the *Yongala***. On March 23, 1911 the 348 foot steamship *Yongala* left the town of Mackay for her scheduled run along the Queensland coast, bound for Townsville with 667 tons of cargo and 48 passengers. Unknown to the captain and crew, a fierce cyclone had picked up force over the Coral Sea and was raging towards the Australian coast on a collision course with the *Yongala*. The two eventually met headstrong in a maelstrom of howling wind and raging seas. The *Yongala* floundered and met her fate 50 miles southeast of Townsville and 11 miles off the Queensland coast.

Today, the *Yongala* is an oasis of life on the sandy ocean floor that stretches between the mainland and the barrier reef. Lying at a 45 degree angle on her starboard side, she sits in 95 feet of water with the top of the wreck 40 feet from the surface. The rusting carcass of the ship is sheathed in encrusting soft and hard corals, seafans, sponges and thousands of oysters. The major attractions include the massive schools of pelagic fish such as trevally, jacks and bonito that inhabit the wreck site.

We anchored over the wreck on unusually flat seas and eagerly geared up as the divemaster spilled the instructions of the dive profile. We followed the anchor line down, pulling against a gentle current as the massive hulk of the ship gradually came into view. I settled on the top of the wreck, adjusted my strobes and looked around at the setting before me. To my left, where the *Yongala's* deck angled towards the seafloor, thousands of silver flashing fish swayed back and forth in a silent ballet. Ahead of me, a squadron of eagle rays, maybe four across, were rapidly approaching like giant birds. I crouched on the hull, raised my camera and fired as they flew overhead, silhouetted against the dispersed Australian sunshine.

"What next?" I wondered, and motioned my buddy Peter to follow me over the deck. Large cavernous openings showed the way into the layers of the ships bowels. Looking in, but not daring to enter, I could see several huge grouper nestled under rusting steel beams. As I retracted, I caught some motion in the corner of my mask and turned to see a massive moray eel extending from his den and looking me over with great interest. I turned tail and followed Peter towards the stern.

We settled on the bottom at 95 feet on the stern and slowly swam into a large basin under the ship and through a large school of silvery jacks. The sandy bottom around the wreck is alive with olive- and black-banded sea snakes which gratefully kept their distance as we swam through. Once on the other side, a large bat ray hiding in the sand suddenly rose in front of us, shook off a mountain of sand, and swam off to look for a more peaceful resting place. After attempting to follow, we stopped and checked our gauges only to realize our bottom time and air were running low. I motioned towards the top of the wreck at Peter and we started a gradual ascent toward the anchor line and back to the surface.

The *Yongala* is considered one of the finest wreck dives in the world and is under protection by the Historic Shipwrecks Act of the Queensland Government. The taking of marine life and artifacts is strictly prohibited and strongly enforced by the charter operators.

Our two days on the *Yongala* seemed too short but we were anxious to get underway to dive the mid-section barrier reef at **Chicken**

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and **Eagle Reefs**. Chicken Reef offers a series of hard coral bommies that drop off around 100 feet with a sand bottom. The southwest side of the reef is laden with several coral swim throughs and overhangs from which hang large gorgonian sea fans. We saw several large red emperors and humpheaded wrasses along the reef.

The main attraction at Eagle Reef is an archway tunnel off the west side of the reef. We entered the first of the two tunnels at 20 feet and followed the sea fan-lined corridor to a sandy bottom at 60 feet. The surrounding reef is made up of bushy staghorn and ribbon coral. We also saw several large anemones with clownfish, vase corals and giant clams.

The last leg of my Great Barrier Reef excursion was to explore the diving along the southern barrier reef and the picturesque islands of the Whitsunday group off the mainland. The Whitsundays are a group of 70 continental islands situated between the Australian coast and the Great Barrier Reef. At roughly the same latitude as Honolulu in the northern hemisphere, the Whitsundays are known as one of the finest sailing areas in the world. The islands also offer easy access to the mid to southern barrier reef from any of the several resorts in the group.

I boarded an Ansett 737 and made the short flight from Townsville to Brisbane and then on to Hamilton Island in the Whitsundays. More of a miniature tropical seaside city than a resort, Hamilton Island boasts a population of some 2,000 guests and resort staff at any one time.

The resort offers several different styles of accommodations ranging from luxurious penthouse suites to rustic cabins. The island also has an Australian wildlife park. Along the marina and harbor complex are several shops, restaurants, bars and galleries. Also along the waterfront is the dive concession, H2O Sportz, a PADI 5-star facility operated by Maree Smith. H2O Sportz runs daily trips out to **Bait Reef** on the barrier reef and several selected sites around the Whitsundays aboard the Whitsunday Diver.

Bait Reef is an expansive circular coral reef about two hours from Hamilton Island. The reef includes an immense shallow coral lagoon which steps off into vertical walls and drop-offs. The better diving is along the west side of the reef in an area called the **Stepping Stones**. Here, a row of steep pinnacles rise from 100 feet to just below the surface.

Schools of bat fish, huge gorgonian fans and a cleaning station make excellent backdrops for underwater photography.

Other popular sites in the reef include **Anemoneville** which is a shallow area just south of the Stepping Stones and **Manta Ray Dropoff**. Here spectacular underwater cliffs plummet over 200 feet in forests of gorgonians and black coral. Lots of pelagic fish and manta rays are common along this site.

A short forty minute trip from Hamilton Island is the popular and luxurious resort complex of Hayman Island. Hayman is set against a lush backdrop of bougainvillea and Australian gum trees on a flat sandy stretch of this small private island. The accommodations here are luxurious enough to rank among the world's top ten resorts by *Lifestyles of the Rich and Famous*. Hayman features an enormous man-made fresh water lagoon that borders the front of the resort.

Although Hayman is not a typical dive resort, there is a full service diving facility

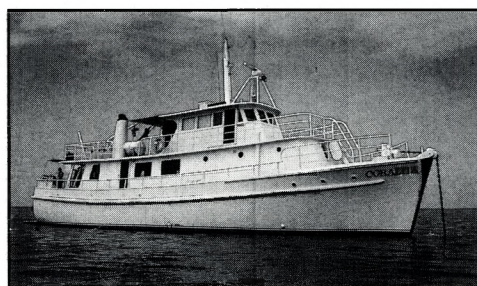
with a separate teaching pool, rentals and repair shop. Day trips out to Bait Reef are handled by Hayman's luxurious dive boat *Reef Goddess* which is 64 feet long and can handle up to forty divers and snorkelers.

Although Australia is not all that different from the U.S. at first glance, with their English language and familiar customs (although they do drive on the wrong side of the road), its beautiful scenery and laid back atmosphere made it hard for me to pack my gear and think about heading back. I had fulfilled my dream of diving the Great Barrier Reef, and although other exotic locals and adventures will soon beckon, I cannot help but think that the Great Barrier Reef will always be at the top of "must dive" list.

Authors Note: I would like to thank the Queensland Tourist and Travel Corporation as well as Tropical Adventures and Air New Zealand for helping to make this trip possible.

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FATHOMING FEAR AMONG THE FISHES



By Melissa Piquett Andersson

"What's short and skinny and afraid of a little bitty fish?" my step-sister would tease. "You are, you are!" Then she'd chase me around with the slimy things. I'd be terrified, simply terrified. One time she threw one at me, it hit my chest and cut me. The gills (or something) actually cut me. Then, more than ever, I was convinced that fish are ugly, they smell bad, and they bite — and if they're dead and can't bite, they cut you instead. Terrible creatures for sure.

As I grew up I had a long talk with myself, a few of them in fact. "So you are afraid of fish," I told myself. "Silly, isn't it? A shame too. As much as you love the ocean... can never relax completely in the water, lest some wild, deranged fish decide to come up and eat you. I mean really, there are no piranhas in the ocean. Actually, there are very few things in the water that are apt to jump up and get you."

Well, OK, there are sh...sha...sharks — the immortalized epitome of ferocious fishes. But reports claim the incidences of shark attacks are quite rare compared to say... getting run over by a car or having the pieces of a dismembered spacecraft drop on your head. They even claim that there are no reports of submerged scuba divers being attacked unprovoked. Of course, "unprovoked" takes on the broad meaning of not haggling with a shark over the rights to a freshly speared fish and/or avoiding the urge to hang around in waters laced with fish guts. Both

are activities I can gladly do without; they've never been really high on my list of "fun things to do."

"Think about the statistics," I continued. "You're at greater risk on the highway and routines of daily existence than you are at from hanging around in the ocean under sensible conditions."

"Why on earth," I bantered on, "should a fairly reasonable person like yourself allow a phobia to continue — a fish phobia, of all things? I mean, Jacques Cousteau is no dummy and he swims around with the things. In fact, it all looks quite beautiful. Perhaps you should learn to scuba dive. That's what you do with phobias. You confront them face to face (or in this case, face to fish)."

I'm not really afraid of the water, not anymore anyway. Not since I was little and that mean old boy sat on my head in the swimming pool. Sat on my head he did, like I was an underwater chair. Thank goodness for mothers and psychic powers. She'd barely glanced away and in the blink of an eye, I was gone. They can hear you calling, even underwater with your mouth full of chlorinated water. Like Wonder Woman, she'd sprung to my rescue, retrieving me from the depths (of a baby pool), saving me from death by drowning — under the weight of a bully's gluteus maximus.

But, like they say, "you fall off a horse; you get back on." You nearly drown; you keep on swimming. There is an infinite

wisdom in that, which saves us from a lifetime of unreasoned fears.

Scuba diving it is I decided, and signed up for a course.

Soon that fated day was upon me, the open ocean dive, my journey into the unknown. Suited up with all sorts of gadgets and paraphernalia, I sat balanced on the edge of the boat. "There should be some sort of ceremony," I muttered, feeling like a sacrificial offering about to be thrust into the hungry mouths of the deep, "a tribal priest and some drums perhaps." No such condolences were offered. Only an instructor, a boat driver and a half dozen other fools were in attendance. The only acoustical accompaniment came from my heart, banging unrhythmically in undignified protest.

"Well, this is what you wanted stupid," the chicken-me snorted. The stubborn-me fought back with an, "it's now or never!" With the dexterity of a pregnant seacow, both me's went tumbling backwards off the boat. "You call that a backroll?" the chicken-me said. "It got us in the water," the stubborn-me responded. "Lucky us," said the chicken-me. "Look," demanded the stubborn-me. "We're going down there so you might as well make the best of it, OK?" "Well, OK," pouted the chicken-me, "but, I'm not going to like it. Not one little bit."

Taking a few deep breaths, I pulled myself back together, put the regulator in my mouth and began the descent. Beneath the



water's surface, the world became still and quiet, quiet-except for one strange and eerie sound, the sound of my own breath reverberating through the life support system. It's like something from a horror movie, I thought, that awful heavy breathing noise they haunt you with right before someone dies. How appropriate for the occasion.

"Don't think about it," I told myself, letting some air out of my buoyancy vest so I could catch up with the other divers already assembled on the ocean floor. "Eeeekk, there are things swimming around in here," I screamed to no one in particular, my mouth full of the rubber breathing apparatus. "Oh my god, there's FISH here and everything!" The theme from *Jaws* began playing in my head as the fish came ever closer. "Here they come; they're going to attack me."

Bright blue and yellow forms slipped by me and in an instant they were gone. Those must be the nice ones, I decided, either that or they've gone on to gather more forces. Just then I felt a tug on my shoulder. Lord have mercy, it's *Jaws*. He's found me. Just get it over with, please, I pleaded mentally. Don't torture me slowly. Another tug on my shoulder and I turned to face the attacker. It was big and black with enormous glassy eyes. The instructor's new mask wasn't very becoming. I must inform him of that later, that is, if I am still alive.

In his hand was something he was trying to give me, a plastic bag with something in it. He motioned me to take it. Uh uh, I thought, trying to look as if I didn't understand. "That's food and fish eat it. They are probably attracted to it. First they'll eat the food, then they'll eat me. They'll get in a frenzy and knock my mask off and get tangled in my hoses and things. No way!", I babbled to myself. "You're the fool that brought it down here. You keep it!"

An angel fish meandered into our vicinity, followed by a school of softly colored colleagues. Out came the food from the bag and the crazy man started to feed the vicious monsters. They darted all around him and gobbled up the pieces. When it was over, my instructor was still alive and he still had all his fingers. "I can do that. It doesn't look so awful." Accepting some dried dog food, I proceeded with my experiment. The next group of fish that happened by were a bit larger than the last ones, but their graceful

movements and brightly colored hues made them appear marginally harmless. Cautiously at first, the creatures approached, and gently accepted the offering from my hand.

Soon I was enveloped in a dancing rainbow of graceful sea life. Like ribbons of light they swirled all around me. "More," I gestured to my instructor, "more food." He motioned me to follow him instead.

Purple sea fans swayed gently with the current and tiny inhabitants scurried into hiding as we glided weightlessly over the reefs. Stopping at a crevice beneath a brain coral, the crazy man motioned me to his side. He pointed, and when I looked, I thought I'd die. Eyeing me from less than two feet away lurked a hideous sea monster. With teeth like a vampire and eyes of evil, the creature was pure unadulterated ugly. The crazy man went closer and I held my breath. The beast slithered out.

"Oh my god, it's a spotted moray eel. What was that the book said?" My mind was reeling, "something about eels being shy hermit-like creatures... will not attack unprovoked, but when threatened can engage teeth in an unrelenting grip. Oh great. This crazy man is going to make it mad and it will attack me. I'll have a heart attack and have to be buried with the monstrosity still attached." They say your life passes before you before you die. Leave it to me to get it backwards. It was my death I was viewing, in full cinematic detail.

The next thing I saw was beyond my comprehension. The eel cuddled up against the crazy man as if he were his long lost friend. My instructor was petting the eel like it was a puppy dog. Now I've seen everything. I must be hallucinating. Rapture of the deep it's called, nitrogen narcosis. The books warned about it, a reaction from diving too deep too long. I checked my depth gauge, 33 feet. Not deep enough to be affected. Obviously, I'm either crazy or I'm dreaming.

My instructor motioned me closer. OK, if I'm dreaming, I'll just wake up and if I'm crazy, it's better to just get it over with. I would hate to be a burden on the family. Slowly, I moved closer. My instructor took my hand. The monster looked at me, then looked back at my instructor. The monster came at me. I willed myself not to panic. The sea monster snuggled up to me in a display of endearing affection.

I'm an old softy. I never could resist kitty cats and puppy dogs. This fellow's a little ugly, a lot ugly actually, beauty is, after all, only skin deep.

The rest of the class came upon us and our shy little friend retreated to his hide-out. My instructor wrote a note on his dive slate while his eyes conveyed the seriousness of his message, "Never pet elsewhere/Monty is old friend/knows me many years/morays can be dangerous/will fight if frightened, like us all."

"Like us all," I thought, "like us all." Why shouldn't the little fellow get grumpy when his home or his life is threatened? At least his fears are justified. So many of our human fears have little substance, beyond our own imaginations. Maybe the crazy man isn't crazy after all. Perhaps he's a philosopher (or psychologist) in fins.

Our instructor motioned us and I knew we were heading back to the dive boat. The coral reefs spread beneath us like a colorful garden. Beauty surrounded me, beauty that I'd been too frightened to notice on the way down and beauty my eyes were only just learning to see.

I was calm now, wonderfully relaxed and thoroughly contented. Part of me knew I didn't want to leave and part of me knew, for now, I must. All of me knew this trip would be only the first of many. I'd return time and time again, experiencing the untold mysteries of what I had yet to explore.

As we ascended, I saw the bright rays of the sun beaming a surrealistic light through the clear, blue water. "Thank you," I said silently. "Thank you Jacques Cousteau. Thank you crazy-man-instructor."



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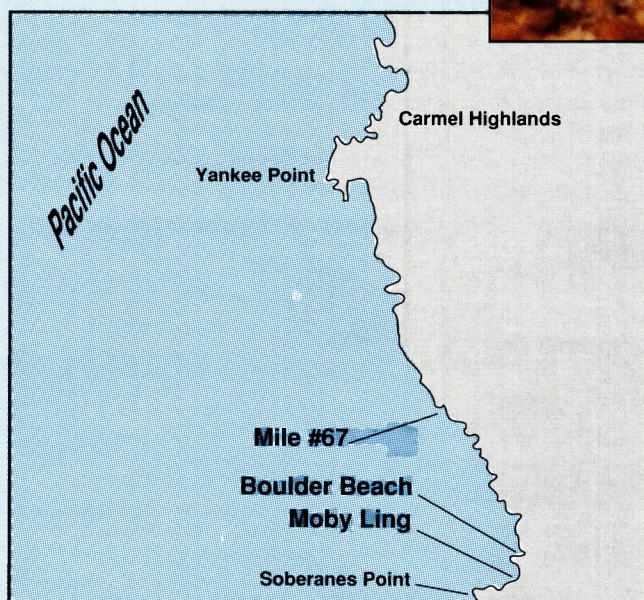
Diving GARRAPATA STATE PARK

Text and photography by Gill Cruz

Shore diving at Garrapata State Park is an experience for the diver who does not mind exercise. Garrapata, located on Highway One south of Carmel, has five dive sites adjacent to one another, all of which require a short hike of about one-eighth mile to the entry points. The primary dive site is **Moby Ling Cove**, a large kelp-filled cove that offers a view of **Lobos Rocks**. The other sites, "**67**", **Boulder Beach**, **No Name Cove**, and **Diablo Break**, also face Lobos Rocks. These areas are unprotected and smaller, but offer the advantage of entries that are not as difficult as the one to Moby Ling Cove. Although all five sites offer good diving, Moby Ling cove has a uniqueness with respect to the other sites.



Above If the photographer is patient, fish macros like this of a black and yellow rockfish can be taken.



Getting to Garrapata State Park is an easy task. Take Highway One about seven miles south from the Rio road intersection in Carmel. The highway is curvy and scenic and meanders through bare, open country. When you arrive at Garrapata, you will find a cluster of cypress on the left side of the road. There are wide spots on both sides of the road that can be used for parking. This area is further identified by the park sign located behind the gate on the left side of the road. The parking spot on the right, which is just past the 66.0 mile marker, has a walk-through gate with the number "13" attached to it. This is the entrance to Moby Ling Cove.

Right: The entry to **Boulder Beach**.

Below: The kelp forest in the pinnacle area in **Moby Ling Cove**.

Lower Right: Another inhabitant of the coralline algae, a hermit crab.



There are two trails just inside the gate, the one to the left leads to a restroom in the trees, while the trail straight ahead leads to the dive site. The trails are narrow, and since there is poison oak in numerous places, it is wise to pay attention to where you walk. After walking about one-eighth mile, always bearing to the left as the trail diverges, you come to a bluff that overlooks the ocean and the site staging area directly below. Go left here and walk down the short steep trail to the lower area, being careful of the tentative footing. The staging area is a wide, open rocky area at the foot of the trail. When doing any rock entry, it is imperative to first determine whether or not the situation is safe and then decide accordingly. If the situation is unsafe there is always another place and time.

Before planning the details of the dive, decide whether to dive in the cove or at the mouth of the cove. It is, unfortunately, not possible to combine the cove and the outer area in the same dive since the swim to the outer area requires a full tank. However, if the cove is the objective, one tank will suffice for covering most of the area. In order to get the most out of the dive day, plan the first dive to survey the cove and the second to concentrate on a specific area. Because of the entry and exit situation, it is recommended to do both dives at the same site. Diving two different sites here can take its toll on the fittest diver as well as the day. Once the decision is made, prepare for the dive.

Since the diving in this location is open ocean, it is a good idea to put a brightly colored marker, like a red or an orange dive bag on the shore where it would be visible from the ocean. This marker serves as a reference point to the divers as they surface. The shoreline terrain at an open ocean site tends to make the shore look the same everywhere, which creates difficulty in locating the exit point. It is safest to carry your tanks, fins and weight belts down to the ledge below the staging area before donning them. The ledge is ideally suited for a

dive platform because it's flat, dry and accessible. Four to six divers can comfortably prepare for their dives.

Accessing the water is a feat that requires an understanding of a few important details about rock entries. You have to study the swells first to evaluate how they interact with the rock ledges, and second to determine how large they are. Correct timing of the right swell at the most opportune moment makes the entry safe and easy to accomplish. Time the swell before entering, to allow the water to do the work for you. With proper timing, the water easily lifts and delivers you to a spot clear of the rocks from which you can begin

diving the protected cove area. This technique is much safer than fighting nature, and it helps to prolong the life of your equipment. To avoid having the swell force you onto the top of the rocks, kick clear of them as soon as you are in the water. At about 25 yards out begin your descent.

The depth at this location is 20 to 30 feet, and the bottom is eel grass-covered rock. Due to the shallow depth, the surge effect can be strong, but you can kick south to the protected area of the cove. Once past the eel grass, the terrain turns into coralline algae-covered rocks. The depth is still shallow. Fish dart in and out of the crevices as you swim by. They

seem to be protecting their homes or hunting for food. Views into the crevices offer sights of small marine creatures, quickly look around, and you are likely to catch a glimpse of a school of kelp bass watching you with the hopes of obtaining a meal created by your fin turbulence. Visibility, as everywhere, varies with the condition of the sea. When the sea is calm and the plankton bloom is at a minimum, the visibility can reach 50 feet. This is more likely to occur in the winter and spring. With the greater visibility you can see the fields of bull kelp which provide cover to countless fish. Working southeast through the bull kelp for about 100 feet you come upon short pinnacles. They are home to many encrusting creatures including sponges, coralline algae and *Corynactis*. Fish such as rock fish and perch use the pinnacles as a refuge and a food bank. This is not, however, an ideal spot for spearfishing since the fish are mainly small and those large enough to take are limited in number. However, the macro and seascape subjects are plentiful for photographers.

After working the pinnacles area, kick toward the northwest for about 125 feet and view the small underwater arch that masquerades as a flat rock near the surface. The depth here is about 50 feet with shallower depths nearer to the rocks.

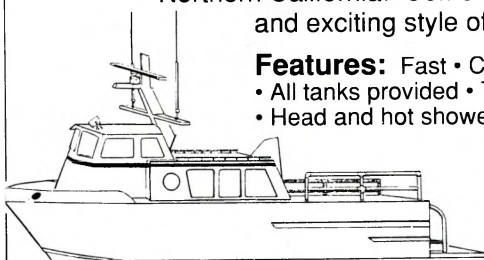
For those in good physical condition who seek a more challenging dive, the diving toward Lobos Rocks at the mouth of the cove, approximately 300 yards plus from shore, is worth the swim. Since the sea floor is less affected by wave action, the visibility is better and the fish are easier to spot. While the fish are not trophy size, they are excellent subjects for photography especially when swimming through the kelp. When the sun is out and the kelp canopy is thick, the sun's rays penetrate

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the water creating a roving spotlight effect. When the kelp is sparse, as during winter, more sunlight penetrates the water illuminating the sea floor with a rainbow of colors and exposing the coralline algae-encrusted rocks below.

Upon completion of the dive, surface and locate the marker on the rocks. Set a compass heading and kick for shore, either on the surface or below. Returning to shore underwater is the recommended choice, because if there is kelp, swimming over it requires more work. Also, when submerged there is more to see and less effort is involved.

Near the shore the bottom rises to a depth of 15 to 20 feet with eel grass-covered rocks everywhere. The grass swirls about the rocks creating a false sense of depth perception, which can mean bruised knees or elbows if care is not taken. Surfacing just off the exit point positions you to time the swells for exiting. The exit is the trickiest part of the dive; it requires good timing, awareness, strength and a sense of adventure. One method of attack is to catch a swell as close to the exit as possible, let it lift you to the platform level, while simultaneously turning your body around so you are facing the sea and then let the swell drop you on the rock platform. The key is to let the ocean do the work for you, and avoid landing on your knees and elbows. Once on the platform, work your way up the rocks far enough to enable you to remove your fins. If you have a shore buddy, he or she can help to get you clear of the water. If you are a photographer, help during the exit is very advisable, since both hands are needed to get out. If you do not get far enough up the rocks, the next swell can roll you back into the cove. Once on shore, the rest of the day is easy except for the short hike or hikes back to the car with the gear.

Diving the Garrapata area is not for the casual diver. The hikes to and from the site and the rocky entry and exit points require a certain level of physical stamina and the ability to handle intermediate to advanced dives. It is, however, a beautiful site with a clear view of the rugged coastline.

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Coral Reef Ecology

Part 3

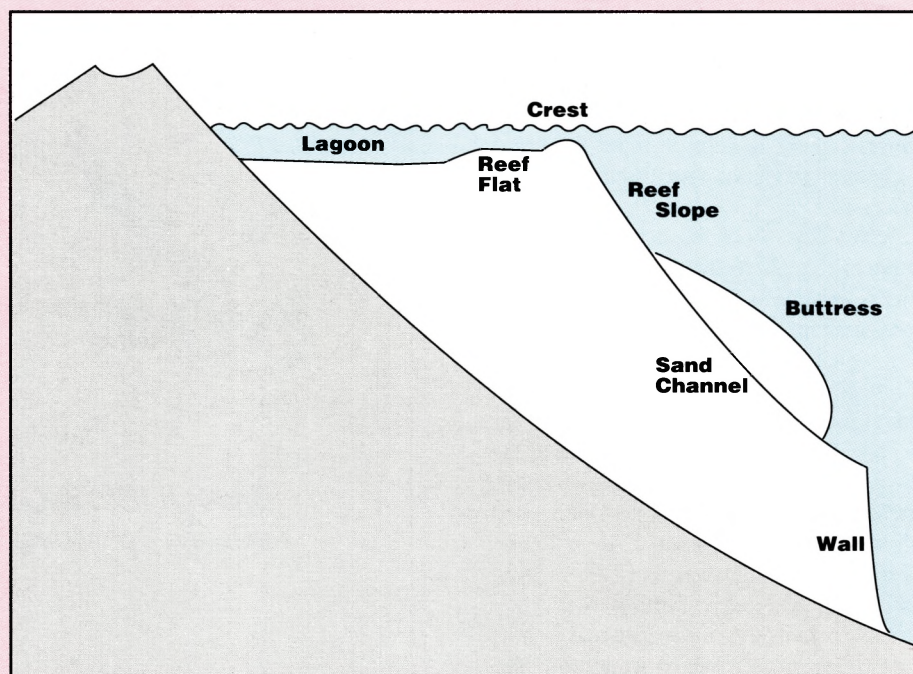
The Zones of a Reef

**Text and photography by
Douglas Fenner**

In previous issues we have explored the location, growth, structure, types and formation of coral reefs. Now, I would like to describe the zones that make up a reef. Coral reefs can be divided into a series of zones with distinct shapes and sets of organisms which live there. Each reef is different, and the zones of an idealized reef do not fit all real reefs. Basically, an idealized barrier reef, beginning at the shore and working outward, has all the zones which a fringing reef has plus a couple of additional zones. An atoll has two sets of zones similar to the one set of a barrier reef. So describing the zones of a barrier reef will give you the zones of the other two reefs as well.

As you move from the shoreline toward a barrier reef, the first zone you pass over is called a lagoon, seen near the left in the diagram above. A lagoon is a relatively shallow area with a flat sandy bottom. A lagoon may be anywhere from about 20 to 200 feet deep depending on the size of the reef: larger reefs usually have deeper lagoons. But even a 200 foot deep lagoon is very shallow compared to the 1-2 mile deep open ocean.

If the lagoon is shallow, there may be a thick growth of sea grasses growing there. Sea grasses are flowering land plants which have moved back into the water. There are only a few species, but they grow very vigorously like the marsh grasses. The animals which live in the lagoon primarily eat and hide in the sea grasses, or burrow in the sandy bottom. Very few corals can live in the sandy lagoon, however once they get started, if they can grow above the level of the sand in a steep



sided patch reef, they may be able to grow vigorously. (I would like to point out that the reason the term "blue lagoon" is used is because it is shallow and has a white sandy bottom, it appears a bright aqua blue from the air.)

As you move out over a barrier reef, the next zone is called the reef flat. A reef flat is a flat area of coral and sand which is shallower than the lagoon, often only one or two feet deep. Some reef flats are covered with growing coral, others have only scattered coral separated by dead coral rock covered with algae or a layer of sand. Reef flats often have water flowing over them from the waves off the reef crest from the open ocean. The currents produced move over the reef flat into the lagoon. If the currents are strong enough, they may dig small sand channels between rows of corals pointing toward the lagoon. There are only a few passes through the barrier reef where water can flow back into the ocean, so the water level in the lagoon and reef flat is relatively stable. This allows corals to grow quite close to the surface without dying from exposure. In fact, if you

have seen a picture where acres of beautiful living coral is growing near the surface, that picture was probably taken on a Pacific reef flat. Reef flats vary greatly in width on different reefs and tend to be wider in the Pacific than the Caribbean. It may be that the larger waves produced by the Pacific provide stronger currents over the reef flat, encouraging coral growth. On an atoll, waves may gather sand together to form temporary islands in this zone, up to about ten feet above high tide. If the island lasts long enough, it may be covered with vegetation and even support a human population.

The reef crest is where the reef extends farthest upward and the waves break. The waves breaking on the crest of windward reefs in the Pacific are often large enough to smash any coral that might grow there. The only thing which can grow on such a reef crest is pink coralline algae. This is an algae that forms smooth sheets on rock such as dead coral, and produces a thin layer of hard calcium which cements loose coral rubble together. A Pacific reef crest is often covered with smooth pink coralline algae which the

waves crash on and slide up and over; trapping water in the reef flat and lagoon. In the Caribbean the waves are generally smaller, and one kind of coral, elkhorn, may grow abundantly and dominate the crest. Elkhorn is a brown coral with branches about the diameter of a human arm which project up into the water at about a 45 degree angle. The branches are thickest at their base, and are longest on the side projecting into the waves. Hurricanes can break elkhorn or any other coral living in shallow water in the Caribbean. But between hurricanes the elkhorn may grow right to the surface in a thicket so tight even a snorkeler can't get through.

The next zone as one moves out across the reef is called the reef front or reef slope. In this zone the reef slopes down into the water from the reef crest to the bottom of the reef. Near the top of the reef front in the Caribbean there is often an area dominated by a relative of elkhorn coral called staghorn coral. This brown coral has smaller diameter branches that look like deer antlers, and forms dense thickets. Some Caribbean reefs are bare of coral in shallow water due to the action of hurricanes. Below about twenty feet there are many different species of coral in the Caribbean, and no one species dominates. This could be called a high-diversity zone. In the Pacific it is less common for an area to be dominated by one species of coral, but several species related to the Caribbean staghorn are abundant in some areas.

If the slope on the reef front is about 45 degrees, there is often a series of ridges and grooves running down the slope. The ridges are made of coral and the grooves are sandy-bottomed canyons. (They can be called spurs and grooves, tongues and grooves, or buttresses and sand channels. The canyons can also be called sand chutes.) They are common in both the Pacific and Caribbean when the reef front has an intermediate slope. What seems to happen is the reef produces large amounts of sand from algae, which produce calcium particles, and animals that grind up coral. The sand slides off steep surfaces and collects in depressions. Where the sand slides off, coral can grow, but where it accumulates the coral is smothered or can't attach. Buttresses consist of coral growing upward as sand slides off, and then the sand channels accumulate sand which keep coral from growing. So instead of the grooves being eroded by the sand, the buttresses are pro-

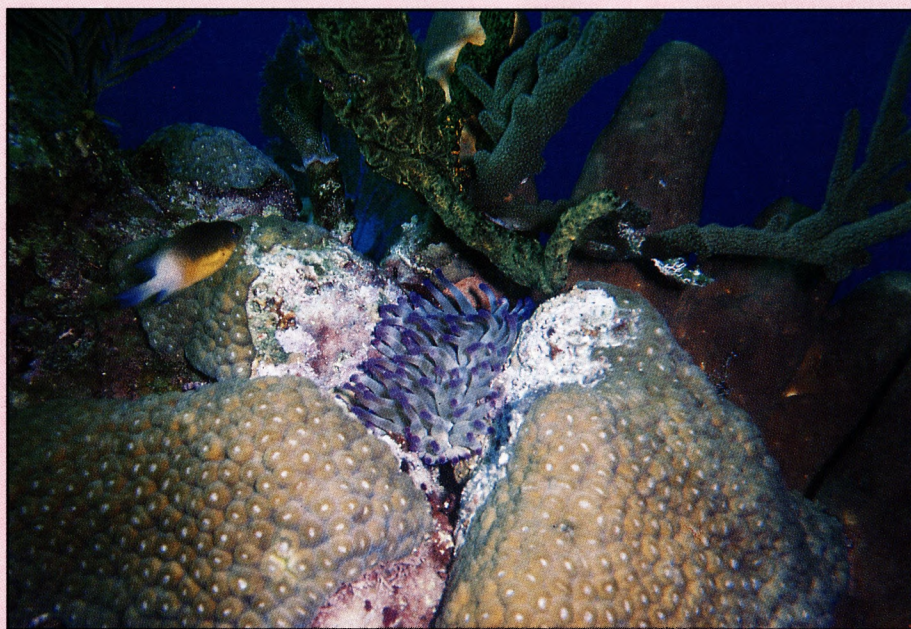


Photo by Doug Fenner.

duced by upward growth of the coral: these features are produced by growth in most cases, not erosion. The sand on the bottom of the sand channel does move down the slope, primarily during storms. It's a good thing that the sand does slide off the reef front, because it has been estimated that a reef produces about three times as much sand as solid coral. If the sand did not slide off, it would accumulate and smother the coral. Perhaps sandy-bottomed lagoons occur because the sand there has nowhere to drain off to, so it accumulates and smothers most of the coral in the lagoon.

An alternative proposal for the origin of the spurs and grooves is that during the last ice age when the reefs were exposed to air, rainwater eroded canyons down the reef front. There is evidence that just such a process occurred in some places, producing grooves that are smaller and closer together than those produced by coral growth.

On many, but not all, reefs below a depth of about 100 feet, the reef becomes very steep. This area is called the deep fore reef, or wall. It usually consists of a vertical face of hard coral rock with a few corals, sponges, and algae growing on it. The wall often extends down to about 600 feet deep, where it ends at a sandy slope which continues down at about a 45 degree angle. Such a vertical wall may have been produced by the coral which grows much more rapidly in shallow

water than in deep water. The coral grows rapidly toward the surface at depths less than 100 feet, whereas at 300 feet it can't grow at all. The slope of the reef continually gets steeper as it grows rapidly in the shallow water, and more slowly in the deeper water. Eventually, when a vertical wall is formed, coral in shallow water may grow out over the wall. If this occurs and too much weight is extended over the ledge, the coral may break off. Researchers using submarines have found huge blocks of coral rock at the base of a 600 foot wall. The blocks, which may be as large as a house, appear to have broken off the wall in shallow water, when coral grew over the wall. Divers can now ride commercial submarines to the base of the wall, or even beyond, at Grand Cayman and several other locations. Animals such as sponges, which live in the dim recesses of caves in shallow water, live in the open on the dimly lit wall. The deeper one goes, the less life one sees since most of the animals that live at the base of the wall are deepwater forms that are not found at sport diving depths.

Sometimes reefs appear to be made of solid rock; walls seem to look especially solid. In fact, reefs are actually an amazing honeycomb. Corals often produce a maze of branches. Sand accumulates in the spaces between the branches, at the base of the coral, making it hard to see what's beneath the coral. Beneath the living coral are more coral

Coral Reef Ecology

skeletons with sand in between them, and with open spaces that form a maze of caves of all shapes and sizes.

One of the clearest ways of seeing this is for one diver to go into a cave, and a second diver to be outside above the roof of the cave. The diver on the outside will see bubbles coming through the roof of the cave, appearing to come out of solid coral. Because much of what appears to be coral rock is actually sand, the reef is not as strong structurally as it appears. During hurricanes and earthquakes, large chunks of overhanging reef and smaller individual corals may be broken off.

Caves are often produced by corals growing outward from the sides of canyons until they roof over the canyon. As a result, there are often two open ends to caves, and holes in the cave roofs. You can also see flat ledges on the sides of many caves which were once live corals growing in a well-lit canyon. Overhangs are usually covered with sponges and algae, while cave walls and roofs are

often plastered with strange sponges. Medium-sized holes in the reef surface provide hiding places for a wide variety of animals. You may find sleeping fish at night, lobster, octopus, moray eels, toadfish, flame scallops, and more. There are many kinds of animals, such as worms, shrimp, crabs, and clams, who burrow into the coral and sand, filling their burrows behind them. Thirty or forty feet below the surface, much of the reef has been burrowed and reworked by these animals, and it takes some searching to find any coral skeletons. Shorelines around coral reefs often have a dark gray rock that's called ironshore. In the spray zone it's full of holes and sharp edges, and can cut you up badly if you try to walk barefoot over it. This is actually coral rock that has been weathered into the rough surface, and darkened by the presence of blue-green algae. The algae live only in the spray zone, and acids they produce etch the rock until it is very rough. If you look carefully in smooth areas of the rock you'll find the imprint of corals embedded in it. This is coral reef rock, similar to that beneath living coral. Far enough down below the reef the weight compresses it into limestone.

We can also distinguish a series of zones in caves and holes in the reef. One zone would be reef surface in sunlight, with lots of corals. Another might be a cliff or overhang that never receives direct sunlight and has few corals, but many more sponges and coralline algae. We could continue into the dark in a large cave with sponges and other animals hanging from its ceiling. Less lives on the cave sides, and almost nothing on the cave floor, due to a constant rain of sand coming from cracks in the reef. Then we could move into the myriad of small holes and cracks in the reef that contain burrowing clams, shrimp, worms, and other animals. The undersides of many plate corals provide a special hiding place for many encrusting organisms. Coral

reefs have whole sets of animals that live only in dark caves, hide under corals, or burrow through the reef. These numerous and important animals are rarely seen; scientists refer to them as "cryptic". Coral reefs are even more intricate than the beautiful reef surface which divers usually see.

Although there is lots of algae on a coral reef, it is often hard to find. What is striking is the abundance of animals. Almost everywhere you look there is an abundance of animals- corals, fish, sponges, but very few plants. In temperate land ecosystems it seems to be the opposite. If you walk through a temperate forest, you see almost nothing but plants- trees and bushes are everywhere, but only a few insects and very few birds and chipmunks. Actually the reef is more puzzling than the land ecosystem, because there must be more plants than animals in any ecosystem. If you think about it, animal food has to come from plants- either directly or through animals that eat plants.

Until recently, it was thought that all food for animals originates from plants using the energy in light produced by fusion reactions in the sun. One exception has now been found that occurs at hot water vents in the deep ocean. Water entering cracks is heated by hot rocks, and dissolves minerals in the rocks. When the hot water comes out of the rocks, it releases minerals, which bacteria can use as an energy source. Animals such as tube worms, clams, and crabs eat the bacteria. So this small food chain gets its energy from rocks which are heated by radioactive decay deep inside the earth. These animals live on energy coming from fission in the earth, while most of us live on energy that comes from fusion in the sun.

To get back to coral reefs, it is a general rule of thumb that it takes about ten pounds of plants to make one pound of animal that eats those plants. So where are all the plants in a coral reef? Well, there is the algae living hidden inside the coral polyps, there is algae hidden inside the coral skeleton, there is algae in sponges, and there are a few algae living out in the open. Those out in the open are often rather inconspicuous, but they grow very rapidly and produce a lot of carbohydrates and calcium carbonate sand. The green filamentous algae are eaten so rapidly by animals that they usually cannot grow very large. Hidden around these algae are

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some called blue-green alae which are actually photosynthetic bacteria. They not only photosynthesize, some can also "fix" nitrogen. That is, they can take nitrogen gas and make ammonia or nitrates which other plants can use as nutrients. These blue-green algae do the same thing that bacteria in the root nodules of alfalfa, clover, red alder trees, and a few other plants can do, they "fix" nitrogen. Perhaps these blue-green algae provide nitrogen for other algae to grow rapidly in the nitrogen-poor tropical seawater.

In addition to these plants, the lagoon bottom may be covered with sea grasses. One estimate is that there is actually three times as much plant matter on a reef as animal, it is just that most of the plants are hidden. Another factor that makes for more animals on the reef is that most of the plants on a reef can be eaten by animals, while most of the plant material in forests can't be eaten by animals. Most animals cannot digest cellulose, so the wood in trees isn't eaten by animals- it is eventually digested by bacteria and fungus which cause rot, or it burns. On a reef, some of the larger algae such as the brown algae and the green algae of the genus *Halimeda* (which forms strings of small green plates) try to protect themselves from animals by producing a covering of cellulose, but none produce anything like the amount of cellulose in a tree trunk. *Halimeda* algae also produces calcium inside its green plates to help protect it, and since it grows rapidly, ends up being a major contributor to the sand around reefs. These protected algae do not have to grow very fast to keep ahead of the browsing animals, but the more numerous unprotected algae have to grow very fast to keep from being completely eaten. The fact that many plants are hidden helps make the reef a delightful and unique place to visit- you are surrounded by animals in a rainbow of colors, often quite fearless in the presence of humans.

Coral reefs appear quite different in the Pacific and Caribbean. And for good reason. Only one of the corals is the same species in the two oceans, and only a few of the fish are the same. Sponges are often more noticeable in the Caribbean than Pacific, because they are often much larger. Pacific reefs can be covered with colorful soft corals, while the Caribbean has no soft corals within safe diving depths. The Caribbean has lots of dull-colored sea whips and a couple of sea fans,

but the Pacific has a few brilliantly colored sea fans. The Pacific has giant clams, crown-of-thorn seastars, sea snakes, and clownfish, but the Caribbean has none of these. These two areas have different organisms because they have been isolated for a long time, and different species have evolved in the two areas.

The first barrier causing isolation may have been the vast "empty" stretches of the eastern Pacific, that have no coral reefs. Westward moving currents in the tropics move both warm water and floating organisms westward, making it harder for animals to spread eastward across the huge gaps. Hawaii is sufficiently isolated to have many marine species which are uniquely local, which scientists call "endemic" species. Some of the reef species found along the west coast of the Americas are endemic for the same reason. But the most decisive isolator was the building of the land bridge in Panama a few

million years ago. Total isolation of the relatively small Caribbean has led to the loss of some species, and the evolution of other new species. So the species on the opposite sides of Panama, only a few miles from each other, are almost totally different.

There is no barrier between the Pacific and Indian Oceans, or the Indian Ocean and Red Sea. So many of the same species found in Tahiti can also be found at the northern end of the Red Sea on the other side of the world! As a result, scientists speak of the Indo-Pacific province, where a province means an area where most of the species are the same throughout. The Indo-Pacific province is the largest in the world. The Caribbean province is much smaller, and includes the Caribbean, southern Gulf of Mexico, the Bahamas, southern Florida, and Bermuda.

The next article in this series will examine corals and how they grow and build reefs.



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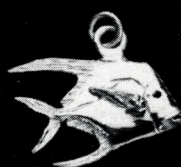
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INTRODUCING THE Hawkfish

By W. Gregory Brown

The hawkfishes are small, colorful reef inhabitants that are well-deserving of their name. Members of the family *Cirrhitidae*, the bottom dwelling hawkfish are represented by 35 known species. The large majority of this family is found among the Indo-Pacific reefs. Divers visiting the Caribbean and western Atlantic reefs can, however, observe the beautiful red spotted hawkfish (*Amblycirrhitus pinos*) moving swiftly from perch to perch. It is the only species of hawkfish known from this region.

The hawkfishes derive their name from their terrestrial counterparts, the hawks. The *Cirrhitids* are stealthy predators that feed on a variety of small fishes and crustaceans. Their prime habitat is a coral or rock outcrop where they can "perch" motionless, scanning the area below them for a potential meal. Once the prey ventures near, the hawkfish "swoops" down upon it with an incredible burst of speed. The term "perch" does indeed provide a good description of the *Cirrhitid's* resting position. All members of the family have thickened pectoral fin rays. They use these modified pectoral fins as props to maintain balance and position amongst the corals.

That is, they perch on their pectoral fins. Another common characteristic of the hawkfish are the feather-like projections called cirri. These tiny epidermal filaments are located at the tips of the dorsal spine. They are quite pronounced in some species such as the spotted hawkfish (*Cirrhitichthys falco*) and far less pronounced in others.

Because hawkfish have evolved a benthic life-style, they remain in relatively small areas for their entire lives. I have returned to a particular reef in Fiji for the past three years to find the same long-nosed hawkfish (*Oxycirrhitus typus*). It not only remains on the same reef, but it perches on the exact same locations as it did in years past. If nothing

else, this is a testament to the predictability of the long-nose hawkfish. It so happens that most other species of hawkfish are equally predictable. As a photographer, it is always good to know such things. Should you frighten a hawkfish from its perch, don't fret, it will eventually return. If it doesn't, you can usually find it on a neighboring coral head.

The *Cirrhitids* are very popular photo subjects. Their exotic patterns and beautiful colors lure photographers like a magnet. Another reason for their photographic popularity is (dare I say) that they don't move around much. This allows even us lazy divers to get some good shots... if we have the right



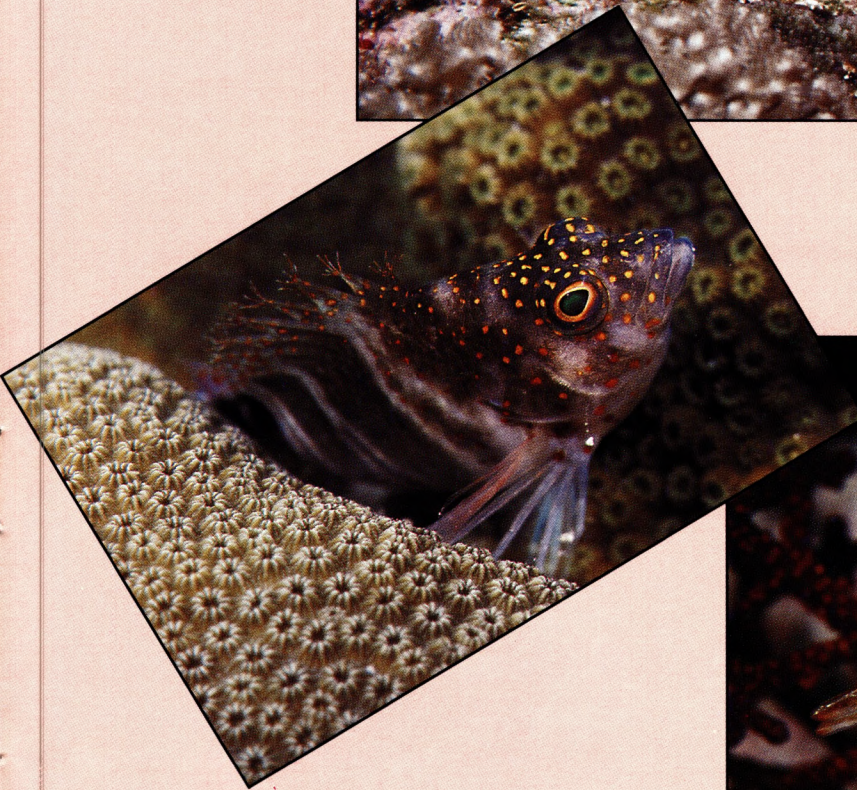


Opposite page Forester's hawkfish

Above Spotted hawkfish

Left Red spotted hawkfish

Below Long nose hawkfish



equipment. For maximum results, use a housed system with a macro telephoto lens. The average size of most *Cirrhitids* is 10-20 cm. They are, in effect, too small and too shy for the Nikonos system. Lenses that are ideal for hawkfish photography include the Canon 100 mm macro and the Nikon 105 mm macro (micro).

Little is known of the *Cirrhitids* reproductive behavior. Limited observations suggest the peak spawning period occurs at dusk. This is the spawning peak for many other reef species as well. The waters are much darker at this time and plankton feeders are beginning to settle in for the night, thus egg predation is greatly reduced. Hawkfish are generally

regarded as monomorphic. That is, males and females of a species cannot be distinguished on the basis of external morphological characteristics. While you may not know whether you are looking at a male or female, at least you know it's a hawkfish, yet another of nature's oceanic wonders.

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SEAVIEWS '91 - March 9-10, 1991

Seaviews '91 Scuba Diving Show will be held March 9th and 10th, 1991, at the Oakland Convention Center in Oakland, California. Open to the public, the event includes two days of diving-related exhibits, fashion shows, an underwater photo display, seminars, and a Saturday night Underwater Film Festival. Seaviews '91 is designed to excite, inform, and stimulate

divers and non-divers who share an interest in the underwater world. For more information, contact Seaviews '91, P.O. Box 1645, Union City, CA 94587-0695, (415) 278-6119

Warm Wind Introduces Deck Coat

Warm Wind has introduced its newest product, the Deck Coat. This waist-length coat is the perfect mid-weather garment for the active outdoor person who seeks warmth as well as protection from the wind. The Deck Coat has a Supplex nylon shell which has the look and feel of cotton while providing the strength and durability of nylon. Warm Wind has lined the Deck Coat with Polartek, the same space age lining used in its popular Warmer parka. This unique lining provides superior wicking ability, dries quickly and is warmer than wool, even when the lining is wet. The Deck Coat is available through scuba dive shops nationally. For the name of the nearest authorized dealer call Warm Wind at (800) 288-WARM.

"We chose NAUI for two obvious reasons."

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"When we decided to try scuba diving on our vacation, we wanted the best training possible. And the best to us means caring attention by a qualified teacher and an emphasis on safety. With our NAUI instructor we got both. Thank you NAUI!"



NAUI is committed to safety through educational excellence. This commitment extends from our family to yours. We train the finest underwater educators in the world, and it's not easy to become a NAUI instructor. But then we understand the importance of family and we won't invite anyone to join our NAUI family unless they would be welcome in yours.

To learn more about our commitment, look for the NAUI logo in your yellow pages, or write NAUI, PO Box 14650, Montclair, CA 91763, for a listing of NAUI educators and programs in your area.

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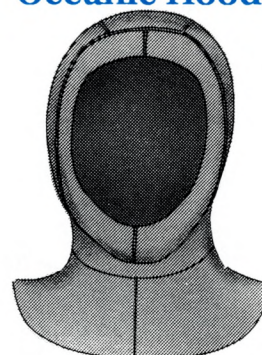
Full instrumentation at a glance, from air consumption to no-decompression diving status.

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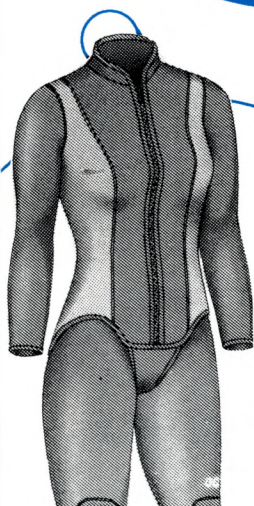
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Tabata's New Marine Boots

Tabata recently introduced the TUSA Marine Boots. The boots are made with vulcanized N2S deck soles for non-slip traction, side zippers for easy entry, capped heel and toe, and comfortable inner soles. Look for this new Tabata product at your local dive store.

HOWARD HALL WINS WILDScreen

Howard Hall won the WILDScreen competition for his recently released film, *Seasons of the Sea*. The film is about California's marine life and WILDScreen recognizes Howard Hall as having made the best wildlife film in the past two years.

The international film festival is sponsored by the British Broadcasting Corporation and is held in Bristol, England. The films are judged by a panel of internationally recognized experts, including Dr. Sylvia Earl, a noted member of the diving community.

Seasons of the Sea aired September 30, 1990 on PBS' series, *Nature*. *Seasons of the Sea* is to be aired regularly on the *Nature* series so if you missed the first airing, be sure to keep your eyes on the local listing because this is a film you won't want to miss!

Seasons of the Sea was produced by Howard Hall with Bob Cranston as associate producer. Mark Conlin and Norbert Wu were

also instrumental in the making of the film.

ONE BIG CONGRATULATIONS TO HOWARD HALL AND ALL THE GANG AT HOWARD HALL PRODUCTIONS!

Wenoka Seastyle's New Back-Pack

Wenoka Seastyle has added a beachy new Back-Pack for 1991. The bag is designed specifically for the weekend with a set of snorkeling gear, mask, fins, and snorkel. The main compartment holds a pair of fins up to 24" long and two outside pockets hold a dive mask and accessories. Padded shoulder straps get it all to the beach with comfort and ease!

Scuba Divers Needed for Research in Grenada & Baja California

Dive the blue-green waters of the Pacific or the Caribbean and make a contribution to science! The Foundation for Field Research (FFR), a nonprofit organization that sponsors scientific research projects, is looking for volunteer scuba divers to assist professional researchers in Baja, Mexico and the island of Grenada. Volunteers contribute both their labor and a tax-deductible share of expedition expenses.

Divers are needed to conduct a marine life census off-shore Cedros Island on Baja's Pacific coast April 7-16, 1991. The underwater

team will travel from San Diego to Baja aboard the dive boat *Horizon*. Divers will reside on the boat during the study.

In Grenada divers are needed August 3-17, 1991 to help retrieve artifacts from Port St. Louis, a 17th century colony that now lies submerged under the shallow waters of St. George's Harbor. For a free brochure describing the expeditions and how you can join, call or write the Foundation for Field Research, P.O. Box 2010, Alpine, CA 91903-2010; (619) 445-9254.

DAN Diving Insurance Expanded to Cover All In-Water Diving Injuries

Current DAN members automatically covered by new \$15,000 insurance plan. New and renewing members have option of expanding to \$30,000 plan for only \$5 more.

The Divers Accident Insurance Plan offered to DAN members has been expanded to cover ALL in-water diving accidents. Coverage was previously limited to serious diving injuries such as decompression sickness, air embolism, and pulmonary barotrauma. New and renewing members have a choice of either \$15,000 or \$30,000 medical and air evacuation coverage. Any DAN member already insured through the old "Prepared Member" plan is automatically enrolled for this new, comprehensive, in-water coverage, at no extra charge! The DAN Prepared Membership is now available with a Divers Accident Insurance Plan offering members a choice of either \$15,000 or



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\$30,000 in maximum benefits per calendar year. Details on DAN membership and the new expanded insurance plan are available by call (800) 446-2671. Minnesota and Canada residents please call collect at (612) 588-2731.

Dive Travel to Roatan

If you've never experienced remote, pristine Caribbean diving (or even if you have), now's your chance to indulge. Join Tab Brewer of the Escondido Sport Chalet February 9-16 on an excursion to exotic Roatan, one of the Bay Islands in Honduras. You'll stay at the beautiful Coco View Resort in Roatan and will enjoy the underwater wonders of the Caribbean as well as Honduran hospitality. For more information, contact Tab at (619) 746-5958.

Underwater 1991

The Channel Islands Underwater Photographic Society will be presenting its 7th annual underwater film show Underwater 1991 on Saturday, Feb. 23, 1991. Marty Snyderman, a renowned underwater cinematographer, will be the Master of Ceremonies for the evening. Held at the Dorill B. Wright Cultural Center at 575 Surfside Dr, Port Hueneme, CA at 7:30 p.m., admission is \$11 in advance. For tickets, mail a check and a stamped self-addressed envelope to CIUPS, P.O. Box 6922, Oxnard, CA 93031. Tickets will be \$12 at the door. For more information, call Terry Schuller (805) 984-7759.

High Tech Diving Comes Out of the Closet

Diving Unlimited Inc. (DUI) will be hosting a "high tech" diving exhibit as part of their DEMA display. Organized jointly with *Aqua Corps: The Journal For Experienced Divers*, the exhibit will feature the latest equipment and methods used by high tech divers in the cave, wreck and other communities. Equipment will include: mixed gas diving sets, a habitat used for decompression, diver propulsion vehicles (DPV's), thermal protection gear, lighting systems and laptop decompression schedule generators. In addition, an ongoing video will present technical diving projects ranging from the *USS Monitor* to Eagles Nest Cave System and military markets. Keeping divers warm in applications as diverse as pipeline tie-ins at 1670 fws, Sealab II to Wakulla Springs, DUI has been a leader in drysuit technology for over

25 years. "It's time that we recognize high tech diving and the people who are at the vanguard of the sport," explains Dick Long, President of DUI. "Whether or not you agree that the risks are reasonable, diving is continuing to evolve and this is the next evolution. DUI does not and

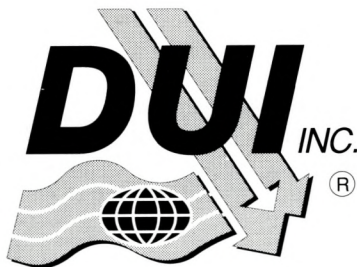
cannot encourage this type of diving. It's dangerous. But we think it's important that people know it exists and learn something about it. We hope our customers and friends will stop by." High Tech Diving will be presented in DEMA booth 1560.

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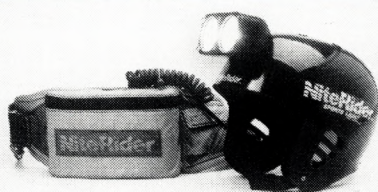
For the DUI dealer nearest you, call toll free 1-800-325-8439.

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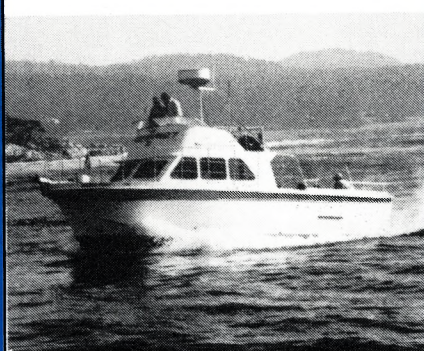
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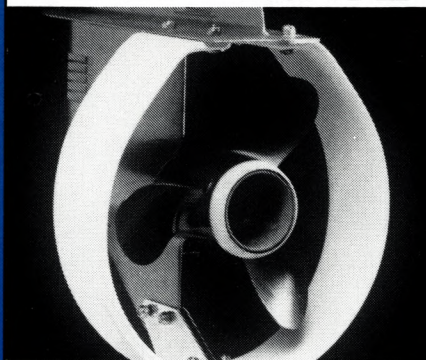
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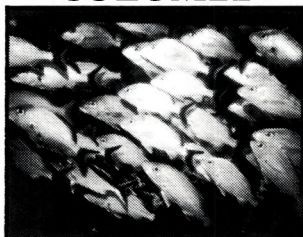
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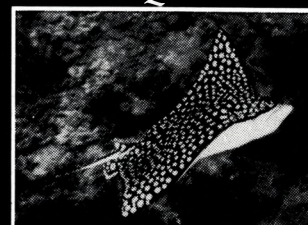
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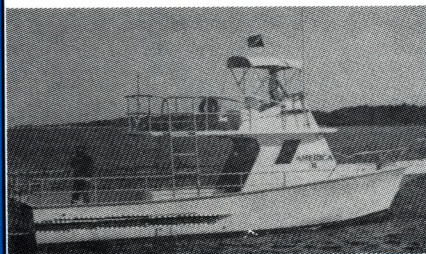
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Advertiser Index

AB Sea Photo	106
Adventure Express/TSMV Reef Explorer	88
Adventures in Diving	28
Air Niu Gini	109
American Institute of Technology	106
Anthony's Key Resort	77
Any Water Sports	94
Aquatic Center	56
Beuchat	2
Bob Straight	99
Body Glove	115
Body Wrap Wetsuits	23
Buhrow Into Dive & Surf	95
Cal Distributor	109
Camera Tech	27
Clavella Dive Boat	22
CPSA	34
Curt Walker Optician	107
Cypress Sea	94
DAN	64, Insert
David of California	107
Del Mar Oceansports	104
Discover Diving Subscription	Insert
Divers Den	18
Diving Charters	56
DUI	105
EI Octotal	61
Emerald Seas Dive Center	22
Foundation of Field Research	109
Harbor Dive Center	27
Horizon Dive Boat	57
I.D.E./Coralita	89
Isla Mia	106
JBL Enterprises Inc.	41
Jim Church Photography	23
John R. Privett, M.D.	77
Kontiki Resorts	8
L. L. Bern/Posidon Compressors	65
Landfall/Bequia	75
Landfall/St. Vincent	18
Landfall	108
Marina Del Rey Divers	56
Marine Camera Distributors	26
Mark Weinhold Cartoon	113
NAUI	4, 102
NAUI College	65
Night Rider Helmet	106
Oceanic	103
Pacific Camera Service	28
Pacific Coast Divers	13
Pacific Offshore Divers, Inc.	95
Pacific Spirit Charters	22
Parkway Imperial	3
PCUPC	29
Peace Dive Boat	107
Precision Marine	69
Project ReefKeeper	98
Prop-Mate	107
Scuda	49, 68
Sea Me Repair	99
Sea Safaris/TSMV Reef Explorer	88
Sea Side Motel	95
SEAVIEWS '91	8
Spear Gunner	94
Spears by Riedel	40
Sport Chalet Divers	6
Sportours	109
Sports Cove	19
Stans Skin Diving Shop	15
Super Dive Chocolates	109
Tabata, USA	116
The America II	109
Tropical Adventures/Mike Ball	87
Tropical Adventures/Coralita	89
Tropical Adventures/Borneo	48
Tropical Adventures	106, 107
Tropical Concepts	47
Truth Aquatics	57
TruWest	19
Twin Otters	106
2 Dive 4	47
Undersea Adventures	13
U.S. Divers	35, 64
USIA	23
Water Education Training	91
Watersport Books	5
Wenoka Seastyle	10
Wet Pleasure	104

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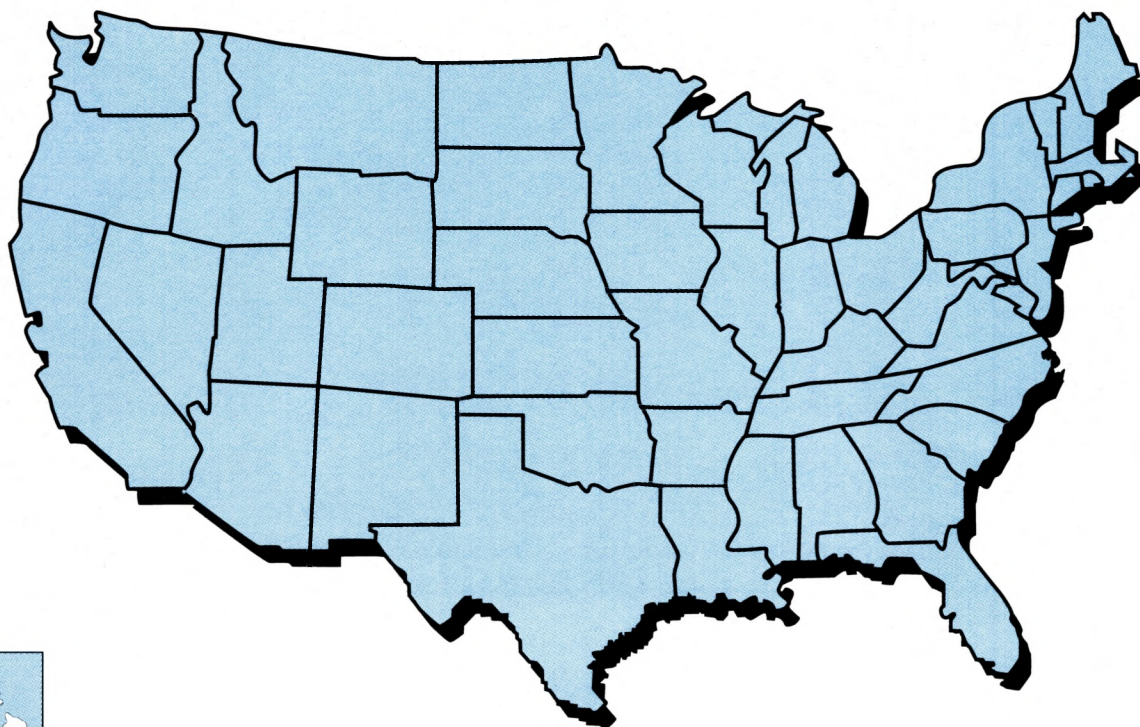
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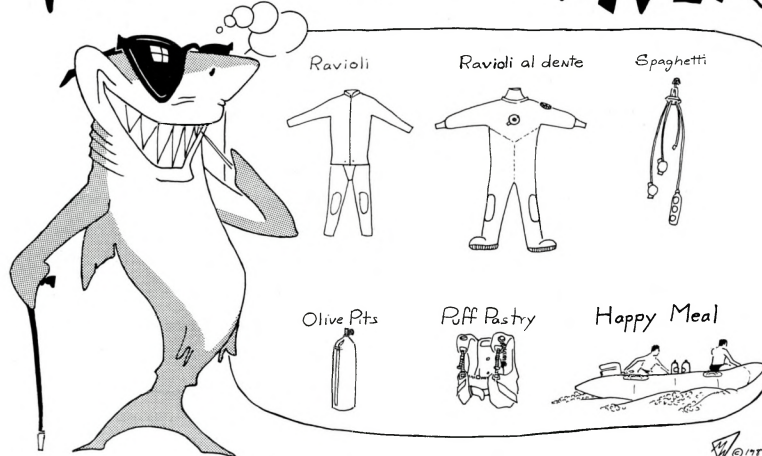
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BENT / Mark Weinhold

How Sharks See Divers



Another Near Miss

(I always liked a near miss. Especially if she's attractive and articulate.)

by Dick Anderson

The problem with telling other people about one's close calls is that people will find out how dumb you really are. A profile of 100 close calls would probably illustrate 99 acts of dumbness and one act of poor judgement. Why should anyone set themselves up for ridicule? Why should one go to the trouble of confirming the suspicions of his associates? No one would. And that's the reason I'm not using my real name.

But here's a note on the positive side: What a vast source of untapped tales lie waiting under the heading, "Dumb things that I have did." It's almost as vast as "Dumb things that other divers done." But this is to be in the form of a true confession and it's not fair to point fingers at guys like Chuck Nicklin who would never confess anything themselves.

Well, here goes, I can't tell about the time, not too many years ago, that I ventured into a cave at Santa Cruz Island and surfaced inside just in time to see my light blink off for the last time. I mean, that was too dumb. (Other language is just too coarse for a magazine that won't even say "bastard".) For my first offering I'll have to choose something in the medium-dumb range.

Well, in the mid-sixties I was working on a dive job in Seattle at a big shipyard. We were covering the bottom of an old wooden dry-dock with sheet vinyl to prevent marine borers from eating the wood. The dry-dock was a few hundred feet long and 125 feet wide. The water was a fluctuating fifty feet or so.

Since it is customary in shipyards for everyone to steal as much as they can, and anything they can, whether they need it or not, and even on Sundays, I used to unscrew my Hookah regulator (for surface supplied

air), harness, check-valve backplate assembly from the air hose and lick it up separately. This action only took a couple minutes each day but it was a nuisance because I had four other guys hanging around yelling, "C'mon Anderson, let's get the hell out of here."

Well, I was in a hose supply store and I spotted a "Super Duper, Brass and Stainless Snap Coupling." "Get it, Anderson", yelled my thoughtful buddies. So I did. But first I examined it closely, and checked the stainless with my ever-present magnet. There was no way for the snap-coupling to fail. I mean, it was a mechanical impossibility. When the locking slide slid closed, captive ball-bearings locked the two parts together, metal to metal. And, if it wasn't put together right it just wouldn't stay together for an instant. Foolproof.

So, from then on when I wanted to disconnect my Hookah backplate it was "Push, pull, click, click, just that quick."

Then, one day, a strange thing happened. I was on the other side of the dry-dock, about 130 feet from the dive boat when I got the word it was quitting time. I started heading back under the dry-dock. In the dry mode the dock drew about ten feet, and I was swimming right underneath. When I got about ten feet from the dive boat side I felt my hose tighten and I could go no further. I knew my hose was hung up on something on the bottom and I began pulling myself down hand over hand as I swam.

Right in the middle of the huge dry-dock, and fifty-five feet deep, I found my hose looped around a piece of scrap protruding from the muddy bottom. I unlooped the hose and began an angular ascent toward the side of the dock. When I was about thirty feet from the edge, and thirty

feet deep, I heard a sound that E.R. Cross had cautioned me about in Hard-hat school; "phuuut." That was it. Not another breath. Half of the snap-coupling was on my back and the other half was on the end of the hose strapped to my belt.

I didn't want to dump my belt because I was wearing about forty pounds of lead to compensate for all the neoprene I was wearing. I was more mobile, I figured swimming, than buoyed up against the bottom of the dry-dock, trying to crawl out. So I just kept on swimming as other options flashed through my frigid noggin. As a last resort my life saver would be to cut off the fitting with my dull knife and breathe directly from the end of the hose. As I was about to exercise that option I reached the edge of the dock and dumped my belt. I lived. If that fitting had popped off while I was down on the bottom, in the middle of the dock, I might not have.

On the surface I examined the "Super-Duper Brass and Stainless Snap Coupling." It was in perfect working order. I tried and tried to get it to malfunction but it wouldn't. It was really foolproof.

There are probably some morals hidden in this tale; If you are fortunate enough to have sub-conscious or conscious warning signals don't ignore them. If you're planning on an accident, always dive with a buddy so he can tell the Sheriff's Rescue Squad where to look for the body. Don't fall in love with your weight-belt. A serious case of bends is better than a mild case of drowning. The ocean's gonna get you if you don't watch out. Join the union and you'll get paid whether you finish the job or not. Brooke Shields would be a fun camping partner.

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91

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